
Thurſday, Novemb. 15. 1677.

At a Meeting of the Council of the Royal Society

Ordered,

That a Book, entituled *Experiments in Conſort of the Luctation ariſing from the Affuſion of ſeveral Menſtruum's upon all kinds of Bodies, exhibited to the Royal Society*, April 13. *and* June 1. 1676. *by* Nehemiah Grew, *M. D. Fellow of the R. S.* be printed by *John Martyn*, Printer to the ſaid Society.

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EXPERIMENTS IN CONSORT OF THE LUCTATION ARISING From the Affuſion of ſeveral MENSTRUUMS Upon all ſorts of Bodies.

To which is added
The Nature, Cauſes, and Power of Mixture.

Exhibited to the Royal Society.

By *NEHEMIAH GREW*, M. D.
and Fellow of the *Royal Society*.

LONDON,
Printed for *John Martyn*, Printer to the *Royal Society*, at the *Bell* in S. *Pauls* Church-yard. 1678.

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EXPERIMENTS IN CONSORT OF THE LUCTATION ARISING From the Affuſion of ſeveral MENSTRUUMS Upon all ſorts of BODIES,

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TO THE
MOST ILLUSTRIOUS
THE
ROYAL SOCIETY,
THE FOLLOWING
EXPERIMENTS
ARE MOST HUMBLY
PRESENTED
BY THE
AUTHOR

NEHEMIAH GREW.

THE

PREFACE.

THE *intent of the following* Experiments *is twofold. The one, To be as a* Demonſtration *of the Truth of one, amongſt other* Propoſitions, *laid down in my Diſcourſe of* Mixture, *ſc.* That it would be a Key to let us eaſily into the knowledge of the Nature of Bodies.

The other, and that conſequently, To be as a Specimen of a Natural Hiſtory of the Materia Medica: *that is to ſay, a multifarious Scrutiny into the intrinſick Properties of all thoſe Materials, which have been, or may be uſed in* Medicine: *for the performance whereof, the following* Method *is exhibited as one, amongſt others, neceſſary to be inſiſted upon.*

on. For what Dominion a Prince *hath over the* Moral, *that a* Phyſician *hath, as one of God Almighty's* Vice-Roys, *over the* Corporeal *World. Whence therefore nothing can more import, than a particular knowledge of the* Genius *of all his* Subjects, *thoſe ſeveral* Tribes *of* Matter, *ſuppoſed to be under his Command.*

The Experiments *may ſeem too numerous to be of one* make. *But no leſs a number would have anſwered*

ſwered the deſign of an Univerſal Survey *; which, though leſs pleaſing, proves the more inſtructive in the end : not being like angling with a ſingle* Hook *; but like caſting a* Net *againſt a ſhole ; with aſſurance of drawing up ſomething. Beſides the advantage of* comparing many together ; *which being thus joyned, do oftentimes, like* Figures, *ſignifie ten times more , than ſtanding alone, they would have done.*

How far the Corollaries *all along ſubjoyned have made this good, is left to the* Reader *to judge. And alſo, to add to them, ſo many more, as he pleaſes; for I make my own thoughts no mans* Meaſure. *Thoſe I have ſet down, if compared, will, I preſume, appear eaſie and natural; which is all I ſhall ſay for them. Let them go and take their fortune without a* Flambeau; *which being prefixed to things of ſo glim-*

mering a ſhew, would no ſerve to blazon, but extinguiſh them.

EXPERI-

EXPERIMENTS
IN
CONSORT
OF THE
LUCTATION
Ariſing upon the Mixture of Bodies.

CHAP. I.

ALthough there are ſome known *Obervations* of this nature ;

yet there is no *Author*, I think, who hath given us *a Syſteme of Experiments in conſort upon the Subject*: the performance whereof, therefore, is here intended.

The Bodies whereupon I made tryal, were of all kinds, *Animal*, *Vegetable*, and *Mineral*. Amongſt *Vegetables*, ſuch as theſe, *ſcil. Date-ſtones*, *Ginger*, *Colocynthis*, *Pyrethrum*, *Hawthorn-ſtones*, *Staphiſagria*, *Euphorbium*, the *Arenulæ* in Pears, *Semen*

Milii Solis, *Tartar*, *Spirit* of *Scurvygraſs*, *Spirit* of *Wine*, &c.

Amongſt *Minerals*, ſeveral ſorts of *Earths*, *Stones*, *Ores*, *Metals*, *Sulphurs*, and *Salts*.

Amongſt *Animals*; ſuch as theſe, *ſcil. Hairs*, *Hoofs*, *Horns*, *Shells* and *ſhelly Inſects*, *Bones*, *Fleſh*, and the ſeveral *Viſcera*, *Silk*, *Blood*, *Whites* and *Yolks* of Eggs, *Sperma Ceti*, *Civet*, *Musk*, *Caſtor*, *Gall*, *Urine*, *Dungs*, *animal Salts* and *Stones*.

The *Liquors* which I poured hereupon ſeverally, were theſe, *ſcil. Spirit* of *Salt Armoniac*, *Sp.* of *Harts-Horn*, *Sp.* of *Nitre*, *Aq. fortis*, *Oil* of *Salt*, *Oil* of *Sulphur*, and *Oil* of *Vitriol.*

In the mixture of theſe Bodies, two things, in general, are all along to be obſerved, *viz.*

Firſt, which they are, that make *any*, or *no Luctation.* For, as ſome which ſeem to promiſe it, make none: ſo, many, contrary to expectation, make a conſiderable one.

Next, the *manner* wherein the *Luctation* is made; being with much variety in theſe *five* ſenſible *effects*.

1. *Bullition*; when the Bodies mixed produce only a certain quantity of froth or bubbles.

2. *Elevation*; when, like Paſte in baking, or Barm in the working of Beer, they ſwell and huff up.

3. *Crepitation*; when

they make a kind of hiſſing and ſometimes a crackling noiſe.

4. *Efferveſcence*; then only and properly ſo called, when they produce ſome degree of heat.

5. *Exhalation* ; when not only fumes, but viſible ſteams are produced.

Of all theſe, ſometimes one only happens, ſometimes two or more are concomitant. Sometimes the *Luctation* begins preſently upon mixture, and ſometimes not till after ſome intermiſſion. In ſome bodies, it continues a great while; in others, is almoſt inſtantaneous: Examples of all which I ſhall now produce; beginning with *Vegetables*, as affording the leaſt variety.

And firſt, if we take Spirit or Oil of Salt, Oil of Vitriol, Spirit of Nitre, or Aq. fortis, and pour them ſeverally upon the ſeveral parts of Vegetables, as Roots, Woods, Stones, &c. we ſhall find, that they are, *generally far leſs apt to make a Luctation, than either Animal, or ſubterraneal Bodies.*

Whence, as from one argument, it ſeemeth evident, That in moſt *Vegetables* , and in moſt of their parts, the predominant *Salt* is an *Acid.* But that, on the contrary, the predominant *Salt* in moſt *Minerals*, and parts of *Animals* , is an *Alkaly :* in the former, uſually a *fixed* ; in the latter , a *volatile Alkaly.*

Again, *although the Luctation which moſt Vegetables, and moſt of their parts make with Acids, be but ſmall, yet ſome they make; eſpecially with ſome Acids, as with Spirit of Nitre and Aqua fortis.*

Whence it ſeemeth plain, That there is an *Alkalizate Salt* exiſtent in many *Vegetables*, even in their *natural eſtate*; and that it is not made *Alkalizate*, but only *Lixivial*, by the *fire*. Or, there is ſome quantity of a *Salt*, call it what we will, in the ſaid Bodies, which is ſo far different from, as to make a *Luctation* with an *Acid.* But to give particular inſtances of the ſeveral *proportions* wherein it appears to be in ſeveral *Vegetables.*

And firſt, of all vegetable Bodies, Date-ſtones are amongſt the leaſt apt to make a Luctation with Acids, if they may be ſaid to make any at all.

Hence they are not ſo potent *Nephriticks*, as many ny other Stones, which make a more ſenſible *Luctation.*

Ginger makes a ſmall Bullition with Aq. fortis, only obſervable by a Glaſs.

Hence the *pungency* of Ginger lyeth in a *ſulphureous* and *volatile Salt*, which yet is very little *Alkalizate.*

Scurvygraſs-ſeed makes a very ſmall Bullition with Aq. fortis, like that of Ginger. So doth alſo the ſeed of Purſlane.

Hence, although there

is much more of a certain kind of *volatile Salt* in Ginger or Scurvygraſs, than in Purſlane ; yet there is as much of an *Alkaly* in any one, as the others.

Colocynthis, Fruit-ſtones, the ſtony Covers of the ſeeds of Elder *, white Bryony, Violets , and others , with Aq. fortis make a Bullition juſt perceivable without a Glaſs.*

Hence it appears, That the great *Cathartick* power of *Colocynthis* lyeth not in an *Alkaly*, but an *Acid*; as making a much leſs *Bullition*, than ſome other vegetable Bodies, which are leſs *Cathartick*. For which reaſon likewiſe it is, That the beſt Correctors, or Refractors of the force of *Colocynthis*, are ſome kinds of *Alkalies*, as particularly that of *Urine*, as *Riverius* hath ſomewhere obſerved.

The Root of Pyrethrum, with Aq. fortis, makes a Bullition and huff, in a ſhort time.

Hence, the Cauſe of a *durable Heat*, upon the Tongue, is an *Alkalizate Sulphur*. For the Heat of Ginger, though *greater*; yet abideth *nothing near ſo long* as that of Pellitory or *Pyrethrum*; which, as is ſaid, maketh alſo a more ſenſible *Bullition* with *Acids*.

Kermes-berries, commonly, but ignorantly, ſo called, with the ſaid Liquor, huff up to an equal height, but in a ſomewhat longer time.

Hence they are gently *aſtringent* ; *ſcil.* as their *Alkaly* binds in with ſome preternatural *Acid* in the ſtomach.

Hawthorn-ſtones, with Aq. fortis, buff up equally with the former Body ; but the Bullition is not ſo viſible. The like is alſo obſervable of Medlar-ſtones.

Hence, as they contain a middle quantity of an *Alkaly*, they are not inſignificantly uſed againſt the *Stone.*

Seeds of Staphiſagria,

with Aqua fortis, make a Bullition ſtill more viſible. But it quickly ends.

This confirms what was ſaid before, *ſc.* That the cauſe of a *durable Heat* is an *Alkalizate Sulphur*; theſe Seeds producing a *durable Heat*, as doth the Root of *Pyrethrum.*

The ſeeds alſo of red Roſes, Borage, and Comfrey do all with Aq. fortis make a conſiderable Bullition and huff; and that very quickly.

So that amongſt all

Shells and Stones, thoſe generally make the greateſt *Bullition*, which are the hardeſt and the brittleſt.

Euphorbium makes a Bullition yet more conſiderable, with much froth, and very quickly.

From which Experiment, compared with two of the former, it appears, That *Euphorbium* is not an *acid*, but an *alkalizate Gum*. As alſo, that the cauſe of its ſo very *durable Heat*, is an *alkalizate Sul-*

Sulphur, as of *Pyrethrum* and *Staphiſagria* hath been ſaid.

It ſeems alſo hence evident, that the power of all great *Sternutatories* lyeth not in their *Acid*, but their *Alkalies*.

The Arenulæ or little ſtones in Pears, cluſter'd round about the Coar, with Aq. fortis, preſently huff up, and make a great Bullition and Efferveſcence, much greater than do any of the Bodies above-named.

Whence, although, ſo far as I know, they have never yet been uſed in *Medicine*; yet is it probable, that they are a more potent and effectual *Nephritick*, than any of the Bodies aforeſaid, and ſome of them uſually preſcribed.

It is hence alſo manifeſt, That, according to what I have elſewhere *ſaid, for the ſweetening of the Fruit and Seed, the *tartareous* and *alka-*

**Firſt Book of the Anatomy of Plants.*

alkalizate parts of the *Sap* are *precipitated* into their *ſtones* , *ſtony parts* , *and ſhells.*

The laſt Inſtance ſhall be in the ſhells of the ſeeds of Milium Solis ; which not only with Aq. fortis, but ſome other Acids, make a greater and quicker Bullition and Effervеſcence, than any other vegetable Body, upon which I have yet made tryal, in its natural eſtate.

Hence, as well as from divers of the laſt fore-going

ing Inſtances, we have a clear confirmation of what I have, towards the beginning of this Diſcourſe, aſſerted; *ſc.* That there is an *alkalizate Salt* exiſtent in *Plants*, even in their *natural eſtate.* As alſo, that they are as ſignificantly uſed againſt the Stone, *quatenus alkalizate*, as *Millepedes*, *Egg-ſhells*, or any other *teſtaceous Bodies* of the ſame ſtrength.

To theſe I ſhall ſubjoyn one or two Examples of Vegetable Bodies which are more or leſs alter'd from their *natural eſtate.*

Neither Cryſtals of Tartar, nor Tartar it ſelf (although they have ſome ſtore of alkalizate mixed with their acid parts) make any Efferveſcence with Acids, but only with Alkalies, as Spirit of Harts Horn, *&c.*

Hence the *calculous ſediment* of *Urine*, not ſo properly called the *Tartareous part* of the *Urine*;

from the quite contrary events following its mixture with the aforeſaid *Salts* ; as will be ſeen hereafter.

Spirit of Scurvygraſs maketh no Luctation with any acid.

Hence (as from a former Experiment was above-noted) it ſeems, That there may be a kind of *volatile Salt*, which is neither *acid*, nor *alkalizate* ; ſuch as this of *Scurvygraſs* and other like *Plants* ſeems to be : *ſcil.*

ſuch a *Salt* as is not properly *alkalizate*, and yet contrary to an *acid*; as experience ſhews in its efficacy againſt the *acid Scurvy*.

Rectified Spirit of Wine, both with Spirit of Nitre, and with Oil of Vitriol, ſeverally, maketh a little Luctation.

Which argues, that there is contained, even in this Spirit, ſome portion of a *volatile Alkaly*.

Spirit of Wine, and double Aqua fortis, as the *ſtrongeſt is called, make an efferveſcence ſo vehement, as plainly to boil.*

Beſides the vehemence hereof, there is another ſurprizing circumſtance. For whereas all other Liquors which make an Efferveſcence together, will do it in any quantity aſſigned to either of them, although but one drop to a thouſand: on the contrary, theſe two, ſc. *rectified Spirit of Wine and Aqua fortis, require a certain proportion the one to the other. For if into* *no more than ſix drops of Spirit of Wine you put in but two or three of Aq. fortis, they ſtir no more than if you put in ſo much Water: but drop in about ſeven or eight drops of Aq. fortis, and they preſently boil up with very great vehemency.*

Hence we may conceive the reaſon of the ſo very ſudden acceſs of an *acute Diſeaſe*, and of its *Criſis.* Theſe not beginning *gradually with the Cauſe*; but then, when the *Cauſe* is arrived unto ſuch an ἀκμὴ, or ſuch a certain *Proportion* , as is neceſſary to bring Nature to the conteſt. And theſe may ſerve for Examples upon *Vegetables*.

CHAP. II.

HAving given ſeveral Inſtances of tryal upon *Vegetables* ; I next proceed to *Minerals*, which , for ſome orders ſake, I ſhall diſtribute into five or ſix ſorts, *ſc.* *Earths*, *Stones*, *Ores* and *Metals*, *Sulphurs*, and *Salts*.

Firſt for Earths. Oil of Vitr. upon Fullers Earth, doth not ſtir it, or cauſe the leaſt Bullition. Nor upon yellow Oker. Nor upon the Oker which falls from green Vitriol. The ſame Oil of Vitr. and Spir. of H. Horn poured ſeverally upon Bolus Armena of two kinds, and upon one kind of Terra ſigillata, ſtir none of them.

Hence *Bolus*'s are the *Beds*, or as it were, the *Materia prima* , both of opacous *Stones* and *Metals* ; into which the ſaid *Bolus*'s are tranſmuted, by being *concentred* with divers kinds of *Salts* and *Sulphurs*, which ſucceſſively flow in upon them.

Aqua fortis, and Oil of Vitr. being poured ſeverally upon another ſealed Earth, which was vended by the name of Terra Lemnia ; they both made a very conſiderable Efferveſcence

ſcence herewith.

Whence it appears, That there is no ſmall difference in the nature, and therefore the operation of *Bolus Armena* and *Terra Lemnia*. As alſo, betwixt the ſealed Earths themſelves, one making a great *Efferveſcence*, another none at all. Whereto, thoſe that uſe them, are to have regard.

Next for Stones. And firſt Spir. of Nitre upon Tripoly, ſtirreth it not in the leaſt.

Iriſh Slate, with Spirit of Harts-horn, maketh a ſmall, yet viſible Bullition: and it preſently ceaſeth. So that it ſeems to be nothing elſe but a *Vitriolick Bole.* As is alſo argued from its taſte, which is plainly acid, and ſomewhat rough.

Whence alſo it is with good reaſon given upon any inward Bruiſes. Becauſe by coagulating the Blood, it prohibits its too copious afflux into the affected part. Yet being but gently aſtringent, and ſo the Coagulations it makes, not great; they are likewiſe well enough carried off from the ſame part in the Circulation; by both which means an Inflammation may be either prevented, or the better over-ruled.

Lapis Hæmatites maketh no Effervеſcence at all either with Alkalies or Acids.

Powder of the green part of a Magnet with Oil of Vitriol maketh ſome few *bubbles , yet not viſible without a Glaſs.*

But the powder of the black part of a Magnet, which is the ſaid ſtone fully perfect, ſtirreth not with any acid. Neither doth the calcined Magnet.

Hence there is ſome conſiderable difference betwixt *Iron* and the *Magnet.*

Lapis Lazuli, with Oil of Vitriol , and eſpecially with Spirit of Nitre, maketh a conſpicuous Bullition.

Hence its *Cathartick* virtue lyeth in an *Alkaly.* For which reaſon it is alſo appropriate, in like manner as *Steel*, to the cure of *Hypochondriacal Affections*; originated from ſome kind of fermenting Acid.

Oſteocolla, with Spirit of Nitre maketh yet a greater Efferveſcence.

How it comes to be ſo great a knitter of broken bones, as it is reputed, is obſcure. It ſeemeth, that upon its ſolution

tion by a *Nitrous acid* in the body; it is *precipitated* upon the broken part, and ſo becomes a kind of *Cement* thereto.

Lapis Tuthiæ, with Spirit of Nitre, maketh an Efferveſcence much alike. And with Oil of Vitriol very conſiderably.

But Lapis Calaminaris *with Oil of Vitriol grows ſtark; as the powder of Alabaſter doth with water. With ſpirit of Nitre it maketh a little Bullition, and quickly. But with Aq. for-*

tis , a great one ; beyond any of the ſtones above-named

Hence both *Tutty* and *Calamy* are *Ophthalmicks* from their *Alkaly*. Which is alſo confirmed , from the efficacy of ſome *Alkalies* of the like uſe.

Hence alſo *Calamy* ſeemeth to partake ſomewhat of the nature of *Silver* : as by tryal made upon that alſo, will hereafter better appear.

Chalk and Oil of Sulphur or Vitriol make as *ſtrong an Efferveſcence as any of the reſt.*

Whence it is ſometimes well uſed againſt a Cardialgia.

Whiting makes as great an Efferveſcence as Chalk. So that it ſeems the ſaline parts are not waſhed away with the water, wherein the Chalk, for the making of Whiting, is diſſolved.

Talk will not ſtir in the leaſt either with ſpirit of Nitre, or Oil of Vitriol.

But that which is called

the Lead-Spar maketh a conſiderable Efferveſcence with both of them ſeverally.

Hence, however this be called *Engliſh Talk*, yet there is no ſmall difference betwixt this and true *Talk*.

To theſe ſtones may be added petrified bodies. As petrified wood; which (that upon which I made tryal) no acid ſtirreth in the leaſt.

Petrified ſhells; upon four or five ſeveral ſorts whereof Oil of Vitriol be-

ing poured , produceth a great Efferveſcence.

The Root or rougher part of the Stone called Gloſſopetra, *with ſpirit of* Nitre, *maketh a conſpicuous Bullition.*

Aſteria, *the Stone ſo called, and found in ſome places in* England, *with Oil of Vitriol , maketh an Efferveſcence at the ſame degree. So doth the* Belemnites, *or Thunder-ſtone, both the larger and the leſſer kinds.*

So that none of theſe

are *acid*, or *vitriolick*, but *alkalizate* Stones.

Coralline, *with Oil of Vitriol, makes a conſpicuous Bullition, yet mild and gentle; that is, with very little, if any heat, and without any viſible Fumes. And red and white Coral do the like.*

Hence they are all of a very gentle operation, and fit for Children, as the caſe requires.

Magiſtery of Coral (prepared the ordinary way) ſtirreth not in the leaſt, either

ther with Alkalies or Acids.

Whence it is evident, That its active Principles are in its preparation deſtroyed and waſhed away: that is to ſay, It is an elaborate Medicine good for nothing. And thus far of Stones.

I next come to Metals and Ores. And firſt for Lead; upon which ſpirit of Salt, ſpirit of Nitre, or Aq. fortis being dropped, it ſtirreth not in the leaſt with any of them: but with

Oil of Sulphur, and eſpecially with Oyl of Vitriol it maketh a ſlow Bullition and froth.

Hence it ſeemeth to be *the moſt alkalizate Metal*. Which is alſo confirmed by a foregoing Experiment upon the *Lead Spar*, which maketh a conſiderable Efferveſcence with any ſort of *acid*. And which likewiſe being calcined, yieldeth a good quantity of *Lixivial* Salt.

Lead-Ore ſtirreth not at

al

all with Aq. fortis or Oil of Vitriol. But ſpirit of Salt makes it bubble, and ſpirit of Nitre makes it boil.

Hence there is a conſiderable difference betwixt the perfect Metal and the Ore.

Burnt Lead and red Lead, make a very ſmall Bullition with Oil of Vitriol, with ſpirit of Nitre a far greater.

Mercury, with Oil of Vitriol, will not ſtir, nor with Oil of Sulphur. But with ſpirit of Nitre preſently boils up.

Hence *Mercury* is a *ſubacid* Metal ; *ſpirit* of Nitre being a *ſubalkaliza* Acid.

The filings of Iron o Steel, with Oil of Vitrio make a fair Bullition, lik that of Minium. But ſpiri of Nitre makes them boi with much celerity.

Hence Iron is likewiſe a *ſubacid Metal.*

Steel prepared with Sulphur maketh a far leſs Efferveſcence with the ſame ſpirit of Nitre, than do the filings.

Hence there is a great difference in their ſtrength. So that ten grains of the filings unprepared, will go as far as fifteen grains or more of thoſe which are prepared, as above-ſaid. Yet in ſome caſes the weaker and milder may be the better.

There is one circumſtance in the mixture of Steel and Aq. fortis, which is ſurprizing; and that is this, That ſtrong Aqua fortis, dropped upon Steel, will not,

not, of it ſelf, make th
leaſt Bullition: but if here
to you only add a drop
two of Water, they preſen
ly boil up with very gre
vehemency.

The cauſe is obſcure
yet it is well known, tha
Water it ſelf will diſſolv
Iron: ſo that it appears
as well by this, as by ſome
other Experiments, tha
even in Water, as mild a
it is, there is ſome kind o
corroſive Principle.

Antimony with ſpirit o
Nitre, and Aq. fortis ſeve

rally, maketh an Efferveſcence; ſomewhat lower than Iron. With Oil of Vitriol the Bullition is ſo ſmall, as difficultly to be perceived with a Glaſs.

Hence it ſeemeth to be of a very compounded nature; if I may ſo call it, a ſubacido-alkalizate Metal.

Crocus Metallor. with ſpirit of Nitre, makes a very little Efferveſcence.

Whence the *Metalline Salt* is not wholly loſt in the preparation, but only diminiſhed. *Anti-*

Antimonium Diaphoreticum, *with Spirit of Nitre and Oil of Vitriol ſeverally*, *makes a conſiderable Efferveſcence.*

Wherefore it is not an uſeleſs *Preparation* ; as from the *Calcination* and *Ablution* uſed therein, ſome have thought.

Bezoardicum Minerale, (*that upon which I made tryal*) *ſtirreth not at all either with Alkalies or Acids.*

To which , let thoſe who make uſe of it, have regard.

Tin, with Spirit of Nitre, makes ſo hot and vehement an Efferveſcence, that it turns preſently, as it were, into a Coal. It makes alſo a fair Bullition with Oyl of Vitriol. And a gentle one with Spirit of Salt.

Wherefore it hath ſomething of the nature both of *Iron*, *Lead*, and *Copper*.

The like remarkable circumſtance is ſeen in the mixture of Aq. fortis with Tin, as with Iron. For Tin *and Aqua fortis of themſelves will not ſtir ; but add a few drops of Water to them, and they boil up with the greateſt vehemency.*

Copper, with Spirit of Salt, and Oyl of Vitriol ſeverally, ſtirs not at all. Spirit of Nitre, and Aqua fortis, both boil it up vehemently.

Neither Spirit of Hartshorn, nor Spirit of Salt Armoniac maketh any Bullition therewith. But both of them, by a gentle ſolution,

tion, that is, gently ſeparating its Sulphur from its Salts, turn it blue.

Hence *Copper* hath a greater proportion of *acid* than *any* of the forementioned *Metals*.

Silver neither with Spirit of Salt, nor Oyl of Vitriol makes any Bullition. With Spirit of Nitre it makes one, but 'tis ſoon over: and then continues to diſſolve ſlowly into white Coagulations. It alſo maketh with Spirit of Harts-horn, or of Salt Armoniac, *a full and deep blue.*

Hence there is a greater proportion of *acid* in *Silver*, than in *Lead*, *Mercury*, *Iron*, *Antimony*, *Tin*, or *Copper.*

Litharge of Silver maketh the greateſt Effervescence with Oyl of Vitriol. Yet ſome with Spirit of Nitre. And with Spirit of Salt Armoniac maketh ſome little huff or elevation. And being mixed with Spirit of Nitre and Spirit of Salt Armoniac both together, produceth a faint blue.

Hence, although the far greater part of this *Lithange* be but *Lead*; yet it ſeems it hath ſome ſmall mixture of *Silver*. But that of *Gold* ſeemeth, for contrary reaſons, not to have any *Gold*.

Gold maketh no Effer-veſcence with any ſingle Salt I know of. But it is commonly diſſolved with AquaRegis, which is known to be a very alkalizate Liquor.

Whence it ſeemeth, That as *Lead* is the *moſt* *alkalizate* , ſo *Gold* the *moſt acid* of *Metals*.

Theſe things conſidered, and other obſervations added hereunto, may poſſibly give ſome directions, not only for the ordering and uſing, but even for the making, imitating and tranſmuting of *Metals*. Thus far of *Metals*.

I will next give one or two Inſtances of tryal upon Sulphurs. And firſt Sulphur vive, with Aq. fortis, maketh an apparent Bullition,

tion, but it is ſome time, before it begins. But the factitious or common Brimſtone, maketh ſcarce any, if any at all.

So that there is no ſmall difference betwixt them.

White and yellow Arſenick make no Bullition either with Alkalies or Acids.

Wherefore the ſtrength of its operation on the Body, lies more in a *Sulphur*, than a *Salt.*

The aſhes either of Pit-Coal, or Sea-Coal, make no

Efferveſcence with Alkalies or Acids.

Whence the ſaline Principle is altogether volatile, and ſublimed away by the fire.

Laſtly for Salts. And firſt of all, Borax maketh no Efferveſcence nor any Fumes with Oyl of Vitriol or Spirit of Nitre.

Hence, it is of a very different nature from *Salt Armoniac.*

Oyl of Vitriol and Nitre make fumes or ſteams, though no Efferveſcence.

Green Vitriol, with Spirit of Harts-horn, is ſcarcely moved. White Vitriol, with the ſame Spirit, maketh a conſpicuous huff. And Roman Vitriol a vehement Efferveſcence.

Whence the *former* is the *leaſt acid*, and the *latter the moſt of all.* Which alſo confirms what I ſaid before of the like natures of the ſeveral *Metals* to which they belong.

Salt of Vitriol, though a fixed Salt, and made by Calcination, yet maketh no

Efferveſcence with the ſtrongeſt acid ; but only with Alkalies ; as may be ſeen upon their mixture, but much better heard by holding the mixture to ones ear.

Hence, there are *fixed Acids*. Which further confirms what I have above aſſerted concerning the nature of *Gold*, *ſcil.* That the *predominant Salt* thereof is a *fixed Acid.*

Sal Martis, with Spirit of Harts-horn, maketh a conſiderable huff.

Hence it is much more *acid* than *green Vitriol*; and is therefore a cooler body.

Alum and Sp. of Harts-*horn make a plain Effervescence.*

Saccharum Saturni with Oyl of Vitriol, ſtirs not at all. With Spirit of Salt, huffs a little. With Spirit of Nitre *much more.*

Hence the *acid* of the *Vinegar*, and not the *Alkaly* of the *Lead*, is the predominant Principle.

Common Salt ſtirs neither

ther with Spirit of Salt, nor with Spirit of Nitre; nor with Aq. fortis. But with Oyl of Vitriol it maketh a great Efferveſcence with noiſe and ſteams.

Hence, even common Salt, though it be not reckoned amongſt *alkalizate Salts*, yet is far nearer in nature to *that*, than to an *acid.* Hence alſo the *Spirit of Salt* is a *ſubalkalizate Acid*, and of a very different nature from *Oyl of Sulphur* or *Vitriol.*

Salt Armoniac, with ſpirit of Nitre, ſtirreth not. But with Oyl of Vitriol it maketh a great Efferveſcence.

Hence *ſpirit* of *Nitre* is a *ſubalkalizate ſpirit.*

Oyl of Vitriol and ſpirit of Nitre, though both acids, yet make a great ſmoak; greater than that which the ſpirit maketh of it ſelf. Which confirms the laſt preceding *Corollary.*

Oyl of Vitriol and ſpirit of Salt, though both acids, yet make a ſtrong Efferveſcence,

ſcence , with noiſe and fumes.

Which further confirms, what was noted before, *ſcil.* that Spirit o Salt is a *ſubalkalizate Acid.*

Spirit of Salt Armoniac, with Oyl of Vitriol, make an Efferveſcence ſo extraordinary quick, and as i were inſtantaneous , tha nothing ſeemeth quicker.

Whence it is probable That if *Gun-powder* wer made of *Salt Armoniac* inſtead of *Nitre*, or wit *both* mixed together; it would be *far ſtronger*, than any kind now in uſe. And thus far for *Minerals*.

I have only one *Corollary* to add, from the whole; which is, That whoever doth undertake the *Natural Hiſtory* of a *Country*, (ſuch as that the Learned Dr. *Plot* hath excellently performed of *Oxford-ſhire*) the foregoing *Method*, ſeemeth ſo eaſie, cheap, and indeceitful for the finding out and well diſtinguiſhing the natures of all kinds of *Metals*, *Ores*, *Salts*, *Earths*, *Stones*, or other *ſubterraneal bodies*; as cannot, I think, be ſupply'd but by others of greater difficulty and expence.

CHAP. III.

I Now proceed to the ſeveral *Parts* of *Animals*; as *Hairs*, *Hoofs*, *Horns*, *Shells* and *ſhelly*

Inſects, *Bones*, *Fleſh and the ſeveral Viſcera*, *Silk*, *Blood*, *Eggs*, *Musk*, *Caſtor*, *Gall*, *Urine*, *Dungs*, *Salts*, *and Stones.*

And firſt of all, the Hair of a mans head, with Oyl of Vitriol, maketh no Bullition at all. Nor yet with ſpirit of Nitre.

So that although it contains a good deal of *volatile Salt* ; yet it ſeemeth either not to be *alkalizate*, or elſe is *centred* in ſo great a quantity of *Oyl*, that the *acid menſtruum* cannot reach it. *Hares*

Hares Furr, with ſpiri of Nitre, *maketh, althoug a ſhort, yet very plain Bullition and huff.*

Hence the *Hair*, an therefore the *Blood*, o ſome *Animals*, is fuller o *Salt*, at leaſt of an *alkalizate Salt*, than that o ſome others. And perhap the *Hair* of ſome men, a of *Blacks*, may be ſo ful of *Salt*, as to make a Bullition like *Hares Furr*.

The ſhavings of Nai *ſtir not at all, either wit Oyl of Vitriol, or ſpirit* o

Nitre : *only with the latter they turn yellow.*

Elks Claws, with ſpirit of Nitre, *make a ſmall and ſlow* Bullition.

Horſes Hoof, *with* Oyl *of Vitriol, ſtirs not of many hours. But with ſpirit* of Nitre, *allowing it ſome time, makes a very plain Bullition, and huffs up very high.*

Cows Horn, *neither with Oyl of Vitriol, nor with ſpirit of* Nitre, *maketh any Bullition, only turneth to a yellow colour.*

Rams Horn ſtirs no with Oyl of Vitriol; bu with ſpirit of Nitre, make a ſmall and ſlow Bullitio

Harts-Horn makes conſiderable Bullition an buff, even with Oyl of Vitriol, which the reſt of th Bodies above-ſaid, will ne do. But with ſpirit of Nitre, it makes yet a greater.

From the foregoin Experiments, and almo all that follow, what wa formerly aſſerted of the *Salts* of *Vegetables* and *Minerals*, is here alſo evident concerning that of *Animals*, *ſcil.* That it is not *made*, but only *ſeparated* by the fire.

It likewiſe hence appears, That the *proportion* of *Salt* in the fore-mentioned *parts* is very different; and that therefore ſome of them are never, and none of them but with good diſcretion, to be ſubſtituted one for another in Medicine.

As alſo, that there is a different proportion of *Salt* in the ſeveral *Ani-*

mals themſelves, to whic the ſaid *Parts* belong.

Next for ſhells; as thoſ of Lobſters, Eggs, Snail and Oyſters: all whic make an Efferveſcence both with Oyl of Vitriol and ſpirit of Nitre. Bu with ſpirit of Nitre th greateſt.

Lobſter-ſhells make a conſiderable Bullition and huff, but no noiſe, nor ſteams.

Egg-ſhells make a Bullition and huff, with ſome noiſe, but no ſteams.

Snail-ſhells make an Ef-

ferveſcence with noiſe and ſteams.

Oyſter-ſhells make one with the greateſt noiſe and thickeſt ſteams.

Hence we may judge, in what caſe to adminiſter *one* more appoſitely than *another*. As alſo *in what proportion*, according to their different ſtrength. Some may be better for *Children*, as being milder. Or for a Body whoſe very ſharp *Blood* or other *Humors*, are very eaſily kindled into *Ferments*.

Or elſe may be ſafeſt, to avoid a ſudden *precipitation* of the *Humors* ; or for ſome other cauſe.

Oyſter-ſhells, and the reſ above-ſaid, make a quicker Efferveſcence, not only with ſpirit of Nitre, but even with ſpirit of Salt, that they do with Oyl of Sul*phur, or Oyl of Vitriol.*

So that *theſe Bodies*, as well as *Metals*, have their proper *Menſtruums* whereby they are beſt diſſolved.

Egg-ſhells calcined, make

with Oyl of Sulphur, or Oyl of Vitriol, or ſpirit of Nitre, a greater Efferveſcence, than when uncalcined. As alſo with ſteams; which uncalcined, they produce not.

The like is ſeen in calcined Oyſter-ſhells.

The longer the Calcination is continued, the quicker and ſtronger will be the Efferveſcence. This I tryed at ſeveral terms, from a quarter of an hour, to five hours. So that after ſo long a Calcination, they *make an Efferveſcence almoſt inſtantaneous.*

The reaſon hereof is, Becauſe the *Sulphur*, being for the greateſt part driven away by the fire; the remaining *Salt* lies now more open and naked to the attaque of the *Menſtruum*, ſo ſoon as ever they are mixed together.

From hence it is plain, That *Egg-ſhells*, and the others above-ſaid, being *burnt*, are far *ſtronger* Medicines, than when *unburnt*.

It is hereby likewiſe evident, That a great portion of their *Salt*, is not a *volatile*, but a *fixed Alkaly*.

To theſe may be ſubjoyned all kinds of ſhelly Inſects. I will inſtance in three or four.

And firſt Bees, with Oyl of Vitriol, ſtir not in the leaſt. With ſpirit of Nitre they make an exceeding ſmall Bullition, without any elevation.

Cochinele makes ſome Bullition with Oyl of Vitriol,

triol, but very ſmall: for the bubbles are not to be ſeen without a Glaſs. But with ſpirit of Nitre the Bullition is more viſible, and joyned with ſome elevation.

Cantharides make no viſible Bullition with Oyl of Vitriol. But with ſpirit of Nitre they do, and buff up rather more than Cochinele. Yet is this done very ſlowly, and comparatively with many other bodies, is not much.

Hence it is not the

quantity , but the *quality* of their *volatile Salt*, which makes them ſo ſtrong an *Epiſpaſtick*. For moſt of thoſe bodies above, and hereafter named, make a greater *Bullition*, and yet are neither *Cauſtick* nor *Epiſpaſtick* in the leaſt.

It is hence alſo evident, as hath been before ſuggeſted, That there are divers kinds of *volatile Salts* , eminently different ; ſome being highly *alkalizate*, others very ry *little*, and ſome ſcarce any thing ſo: ſuch as thoſe of *Scurvygraſs*, *Anemone*, *Crowfoot*, and many the like *Plants*; to whoſe *Salts*, this of *Cantharides* ſeemeth to be very near of kin.

Millepedes make a Bullition and huff, much greater and quicker, than any of the Inſects above-named: and that both with ſpirit of Nitre, and Oyl of Vitriol it ſelf. Yet is this Inſect of a very temperate nature.

Whereby is further demonſtrated, That the being *ſimply alkalizate*, is not enough to make a body to be *Cauſtick*.

Again, although Mille*pedes make a Bullition, greater than any of the Inſects above-named: yet is it much leſs, than that of Oyſter, Snail, or even* Egg-*ſhells; and of divers other bodies above, and hereafter mentioned.*

Hence, being given to the ſame intent, as any of thoſe bodies; it is the mildeſt and gentleſt in its operation of them all.

Millepedes likewiſe calcined, make a ſtronger Effervеſcence, than when uncalcined, as do Oyſter-ſhells, &c.

So that it appears, That *all Teſtaceous Salts*, are, at leaſt in part, *fixed Salts.*

I next proceed to Bones. And firſt Whale-bone maketh no Bullition at all with any acid.

A Cartilage, *with ſpirit of* Nitre, *makes ſome very ſmall bubbles, not to be ſeen*

ſeen without a Glaſs.

The Bone in the Throat of a Carp, makes a little and ſlow Bullition with ſpirit of Nitre.

The Spina of a Fiſh (that which I uſed was of a Cod-fiſh) maketh a Bullition one degree higher.

All ſorts of Teeth, as of Dogs, Boars, the Sea-Horſe, Elephant, make the like. As alſo the Bone of an Oxes heart.

So that all theſe are very gentle in their operation, and fit for *Children.*

Sheeps and Calves Bones both of them make a Bullition yet a little higher, eſpecially with ſpirit of Nitre.

Cocks Bones ſomewhat higher than the former.

Cranium humanum a little higher than all the reſt.

Bones likewiſe, being calcined, make a Bullition with Acids. And ſo doth alſo calcined Harts-horn. But in neither of them, is the Bullition advanced by Calcination, any thing comparable

parable to what it is in ſhells.

Whence it appears, That the *Salt* of *Horns* and *Bones*, is much more *volatile*, than that of *Shells.*

Next for Fleſh and the ſeveral Viſcera. And firſt, dryed and powdered Mutton, with Oyl of Vitriol, ſtirs not at all. But with ſpirit of Nitre makes a ſmall Bullition and huff.

Sheeps Heart doth the like ſomewhat more apparently.

Vipers fleſh produceth a

froth, but huffs not.

Powdered Earth-worms make a great froth, and huff a little.

Powdered Tripe makes only a little Bullition.

Lamb-ſtones do the like.

Kidney, Spleen, and Liver, with ſome elevation.

Lungs, with bubbles very large; becauſe extraordinary ſlowly.

Dryed Brain makes alſo a little and ſlow Bullition.

Hence, there is a greater proportion of *Sulphur* or *Oyl*, and leſs of *an Alkaly in all theſe parts*, than there is in *Bones*, *Shells*, and divers other *parts* hereafter mentioned. And in ſome of them, as in the *Brain*, that *Salt* which there is, may rather be lodged in ſome *ſanguineous* parts mixed with them, than in their own proper ſubſtance.

I proceed to inſtance in all ſorts of Animal *Contents*.

And firſt, raw Silk, with ſpirit of Nitre, *makes* *a very ſmall Bullition, but the elevation is conſiderable.*

The grumous part of the Blood dryed, with Oyl of Vitriol, ſtirs but little. But with ſpirit of Nitre it huffs up conſiderably.

Serum of Blood dryed, with the ſame ſpirit, makes a plain elevation, with a little Bullition.

Herewith may be reckoned the White of an Egg, which is nothing but a pure Cryſtalline Serum ſeparated from the common ſtock.

This being dryed, with ſpirit of Nitre, buffs up rather more than even the grumous part of the Blood, the bubbles are much larger, break oftner, and the elevation ſooner made.

Whence it ſeemeth, that there is a greater quantity of a *volatile Alkaly* in proportion to the *Sulphur*, requiſite to the *Generation*, than to the *Nutrition* of an Animal.

The Yolk of an Egg is ſcarce moved with ſpirit of Nitre, producing only a very *ry few Bubbles.* The *Salt* being either little *alkalizate*, or elſe *immerſed* in ſo great a quantity of *Oyl*, that the *Menſtruum* cannot reach it.

For the ſame reaſon Sperma Ceti ſtirs not with any Acid. Neither doth Civet.

Ruſſian Caſtor, with Oyl of Vitriol, ſtirs not. But with ſpirit of Nitre *makes a conſiderable buff and froth. Yet it requires time.*

Wherefore it ſeemeth, That *Caſtor* by virtue of its *alkalizate Sulphur*, becomes ſo good a *Corrector* of the *acido-alkalizate Sulphur* of *Opium*: ſo I take leave to call it, having ſome reaſons to believe it ſuch.

Musk, with Oyl of Vitriol, ſtirs not. But with ſpirit of Nitre it makes a conſiderable and quick Bullition, with large bubbles, which often break and riſe again.

Whence there is a very eminent difference betwixt *Musk* and *Civet*.

Hence alſo, *Musk* is Cordial, not only from its *Sulphur*, but its *Alkaly*; by both directly oppoſite to preternatural *Acidities*.

Dryed Gall with ſpirit of Nitre for ſome time is ſtill : but at length it makes a conſiderable Bullition and froth.

The reaſon why it is ſo long before it begins, is becauſe the *Salt*, (as was obſerved of ſome other *Parts*) is *locked* up in ſo great a quantity of

Oyl. The abundance whereof is manifeſt, not only from *Deſtillation*, but alſo from hence, In that the dryed *Powder*, in lying by, incorporateth all together into one body, as *Mirrh*, and ſome other ſofter and oily *Gums* are uſed to do.

Extract of Urine, with ſpirit of Nitre, makes a Bullition with ſome Efferveſcence, which continues for a conſiderable time; and at laſt it buffs up with great bubbles. The Bulli-

tion begins preſently: the Salt being copious, and the Oyl but little.

The ſame Extract of Urine makes a conſiderable bullition and froth, not only with ſpirit of Nitre, but even with Oyl of Vitriol.

Hence the *Salt* of *Urine* is more *alkalizate* than that in moſt of the afore-ſaid *Contents.*

From this and ſome of the following *Experiments*, it alſo appears, That the *Salt* which concurs to the generation or conſtitution of *Gravel* or of a *Stone* in the *Kidneys* or *Bladder* ; is of a very different nature from the Salt of *Urine*.

Next for Dungs. And firſt *, dryed Goats-dung* makes*, with ſpirit of* Ni-tre*, a ſmall bullition , but* no *elevation. That of Mice* the *like. And that of Cows.* So *that of all I have tryed,* the*ſe three ſtir the leaſt.*

Gooſe-dung, with ſpirit of Nitre *, makes a very ſmall bullition and ſome eleva-*

elevation. But it requires time. Oyl of Vitriol ſtirs it not.

Album Græcum , with ſpirit of Nitre *, beſides innumerable ſmall bubbles, riſes up with ſome great ones , exactly reſembling the huffing up of Yeſt or Barm. Alſo with Oyl of Vitriol it maketh ſome little froth, but ſlowly.*

So that it ſhould ſeem, that the *Bones* are a little *opened* by ſome *acid Menſtruum* in the Dogs ſtomach (as the body of *Steel* is in its preparation with *Sulphur*) whereby it becomes a good mild *Topick* in *Quinzies.*

Hens dung, with ſpirit of Nitre *, makes a very great bullition and huff: greater and quicker, than any of the reſt above-named.*

But of all I have tryed, Pigeons dung, with the ſame Spirit, maketh the greateſt and the quickeſt Efferveſcence and huff; and that not without ſteams. Yet neither the ſame

Dung, *nor that of Hens*, *is moved in the leaſt with Oyl of Vitriol.*

The cauſe of ſo great an *Effervescence* in theſe, more than in the reſt, is that *white part* which is here mixed in a great quantity with the *Dung*. Which *white part*, deſcendeth not from the *Stomach*, but is an *Excrement* ſeparated from the *Blood* (as are *Gall* and the *Succus Pancreaticus*) by a peculiar *Organ*, which evacuates it into the *Inte-*

ſtinum rectum ; whence, together with the *Stercus*, it is excluded.

Hence it is evident, That in the ſaid *white part* of *Hen's*, and eſpecially *Pigeons dung*, is contained a great quantity of a *volatile Alkaly*.

I proceed to Salts. And firſt Salt of Blood and Urine both make a more durable Efferveſcence with Acids, than doth Salt of Wormwood, or Salt of Fern.

Hence the former are more *alkalizate*, than the latter.

Again, though divers other Animal Salts will not ſtir with Spirit of Salt, or with Oyl of Sulphur or Vitriol ; yet the Salt of Blood will make an Efferveſcence with all kinds of Acids.

Whence it is further argued to be highly *alkalizate*, and very proper for the *correction* of all ſorts of *preternatural A-*

cids in the body. There is little doubt, but that *Spirit* of *Harts-horn* will do the like.

The Tartar or Gravel which precipitates out of Urine, with Oyl of Vitriol, makes no bullition in the leaſt. Nor with ſtrong ſpirit of Salt. But with ſpirit of Nitre, *it makes a very great one, with* Effer*veſcence and ſteams.*

From hence it appears, That there is much difference to be made in the uſe of *acid Diureticks*, *Nephriticks*, &c.

And that I may not altogether omit to mention, what may be ſo much for the good of mankind, I do here declare, That for preventing the generation of the *Stone*, either in the *Kidneys*, or in the *Bladder*, there are not better *Medicines* in the world, than ſome certain *Preparations* of *Nitre*, duly adminiſtred. Who-ever ſhall think that any kind of *acid*, as *Oyl of Sulphur*, *Oyl of Vitriol*, *Spirit of Salt*, or the like, will have the ſame effects, will find themſelves much deceived in their practice.

I conclude with Stones. And firſt, Spirit of Nitre dropped upon a Stone of the Kidneys or Bladder produceth the very ſame effect, as upon the Gravel in Urine. That is to ſay, it makes it boil and huff up, until at length it is *perfectly diſſolved into a ſoft Pulp; which neither Oyl of Sulphur, nor Oyl of Vitriol, nor Spirit of Salt will do; nor give the leaſt touch towards its diſſolution.*

This confirms what I ſaid before of the uſe of *Nitre* and *Nitrous Spirits*, if duly prepared and adminiſtred, above any other *Acids*, againſt the *Stone*.

Pearls, with any Acid, make the like Efferveſcence

ſcence, as do Oyſter-ſhells.

Magiſtery of Pearls, as uſually prepared, ſtirs not at all, with any Alkaly or Acid.

So that as to the effect frequently intended by it, it is very inſignificant; as of that of *Corals* hath been ſaid.

Crabs Eyes, with any Acid, make an Efferveſcence, almoſt as quick as that of Oyſter-ſhells.

Crabs Eyes likewiſe calcined, make a ſtronger Ef-

ferveſcence, than when uncalcined.

So that *theſe*, as well as *Shells*, contain a *fixed Alkaly.*

The ſtones in Whitings heads make a ſtrong Effervescence like that of Oyſter-ſhells.

Stone of humane Gall, ſtirs not with Oyl of Vitriol. But with ſpirit of Nitre *maketh a little bullition juſt upon mixing, and after a conſiderable time, a little froth. Much leſs than what*

what was obſerved before of the Gall it ſelf.

So that it ſeemeth to be generated of the *Gall coagulated* by ſome *Acid*, which hath already *refracted* the *Alkaly* wherewith the *Gall* abounds.

This confirms the uſe of thoſe *Medicines* in the *Jaundies*, or any other bordering *Diſeaſe*, which deſtroys thoſe *Acidities* by which the *Gall* is *curdled* or *coagulated*, and ſo rendred more difficultly ſeparable into the *Guts.*

Bezoar, neither the Weſtern, nor the Eaſtern, doth ſtir at all with Oyl of Vitriol.

Weſtern Bezoar, with ſpirit of Nitre, makes a very little thin froth, and that's all; and that it doth very ſlowly.

But Oriental Bezoar, with ſpirit of Nitre, after ſome time, maketh a very great Effervеſcence, with froth, elevation, noiſe, and ſteams (as if you poured

Oyl of Vitriol upon Salt of Tartar) *till it be wholly diſſolved by the affuſed Spirit, and turned into almoſt a blood-red.*

Hence it may ſeem to be no mean *Remedy* againſt ſuch *fretting* and *venenate Acids*, as oftentimes in *Feavers*, and other *Diſtempers*, lye about the *Stomach*, and are thence frequently tranſlated to the *Heart*, *Brain*, *Nerves*, and other *parts*.

The difference likewiſe betwixt the *Weſtern*, and the *Eaſtern Bezoar*, is ſo great, that in any caſe of danger, and where the *Bezoar* is relyed upon, it is an unpardonable fault, for the *Apothecary*, or any *Perſon*, to *ſubſtitute* the one for the other: unleſs he will take *ten times* as much, or *ten times* as little of the one, as he would have done of the other: if that will ſerve turn.

The Stones already

mentioned, are ordinarily generated in the bodies of Animals. I have one inſtance more of ſome other Stones which are extraordinary. In the City of *Hereford* lives a Maid, who often voids theſe ſtones, and in the ſpace of ſome years laſt paſt, hath voided ſeveral pounds, of ſeveral colours, and ſizes, not only *per vias urinarias*, but alſo by vomit, and by ſtool. The firſt mention made to me of them, was by Mr *Digges*, a worthy Gentleman of that City, as a thing that was there much wondred at. And ſome of them, upon my deſire, were ſent me by Mr. *Wellington*, a noted Apothecary in the ſame place. *I have tryed what ſeveral acid Menſtruums will work upon them; and find, That with Oyl of Vitriol, and eſpecially with ſpirit of Nitre the great ones make a very quick and conſpi-*

conſpicuous Efferveſcence. But the ſmall ones, neither the white, nor the grey, make any bullition in the leaſt: for in truth, they are no other but little Pebble and greet Stones.

This being conſidered, and the various *colours* and *mixture* of any one of the great *Stones*, being well obſerved; it ſeemeth plain, That although ſhe be ſomewhat old (above thirty years) yet may ſhe have a kind of μαλακία, or *diſeaſed Appetite* to *Stones*, *Bones*, *Wood-aſhes*, *Tabaco-pipes*, *Chalk*, and ſuch like things; which ſometimes ſwallowing in little *lumps*, ſometimes groſly, or finely *ground* betwixt her teeth; they are in her *Stomach* and *Bowels*, more or fewer of them, *cemented* together, either with a *pituitous*, *bilious*, or ſome other more or leſs *glutinous ſubſtance*. And that by virtue alſo of the ſaid *Cement* , or any of the ſaid, or other like *alkalizate Bodies*, the greater *Stones*, which conſiſt of thoſe partly , do make an *Efferveſcence* with *acid Liquors*. Thus far of *Inſtances* upon the *parts* of *Animals*. I ſhall cloſe with ſome *Corollaries* deduced from the whole.

And firſt , ſince we find, that amongſt all the *Menſtruums* we have made uſe of, *Spirit* of *Nitre*, or any very *Nitrous*

Spirit, is the moſt *univerſal diſſolver* of all kinds of *Animal bodies* ; the *beſt diſſolver* of many others both *Vegetable* and *Mineral*, and the *only diſſolver* of ſome : Hence it is probable, That the great *ſtomachick Menſtruum*, which either *diſſolves*, or *opens* almoſt all *Bodies* which come into the *Stomach*, is a kind of *Nitrous Spirit*.

Again, *Spirit* of *Nitre* being a *ſubalkalizate Acid*,

cid, and working more evidently upon *Animal bodies*, than other *ſimpler Acids* do, which yet are as *ſtrong* ; It hence follows, That moſt of the *Salts* of *Animals* are *ſub-acid Alkalies*. How far this *concluſion* may further inſtruct us, I ſhall have occaſion to ſhew in another *Diſcourſe*.

Laſtly, there being ſo many, ſay twenty or thirty *degrees*, from the *ſloweſt* to the moſt *vehement*, in the *Bullition* of *mixed Bodies* ; it ſeemeth, That *Fermentation* it ſelf , as to the *formal notion* of it, is nothing elſe : or that from the common *Luctation* of *mixed Bodies* whereof we have now bin ſpeaking , it differs not *in ſpecie*, but only in the manner of its *cauſation*, and in *degree* : the *Aer*, or ſome certain *Menſtruum* lodged therein, being of no greater *ſtrength*, than to produce a *Bullition* or *Luctation* of that *low* and *ſoft degree*, which we call *Fermentation.*

I have thus endeavoured to prove, by various *Inſtances*, how inſtructive this moſt eaſie, plain and ſimple *Method* in the *Mixture* of bodies, may become to us: & that meerly by obſerving the *Luctations* which thence ariſe betwixt them. How much more then, if a diligent remarque be made of all thoſe various *Colours*, *Smells*, *Taſtes*, *Conſiſtencies*, and other *Mutations* thereupon emergent ?

FINIS.

thoſe various *Colours*, *Smells*, *Taſtes*, *Conſiſtencies*, and other *Mutations* thereupon emergent ?

FINIS.

At a Meeting of the Council of the *R. Society.*

January 21. 167$\frac{4}{5}$.

Order'd,

THAT a Diſcourſe made before the R. Society, Decemb. 10. 1674. *by Dr.* Nehemiah Grew, *Concerning the Nature, Cauſes, and Power of Mixture,* &c. *be Printed by the Printer of the* R. Society.

Brouncker. *P.R.S.*

A DISCOURSE

Made before the
ROYAL SOCIETY,
Decemb. 10. 1674.
Concerning the
Nature, Cauſes, and Power of

MIXTURE.

By *Nehemiah Grew*, M. D. and
Fellow of the *R. Society*.

LONDON,
Printed for *John Martyn* Printer
to the *Royal Society*, and are
to be Sold at the *Bell* in St.
Pauls Church-yard, 1675.

To the Right Honourable
WILLIAM
Lord Viſcount
BROUNCKER,
PRESIDENT of the
ROYAL SOCIETY.

My Lord,

ONE Reaſon why I dedicate the follow-

lowing Diſcourſe *to Your* Lordſhip, *is becauſe by Your great and undeſerved reſpects, You have obliged me to do no leſs. How much more I cannot ſay, unleſs I were able to compute the value of Your obligation.*

Another Reaſon, *my* Lord, *is because I could not but*

but publickly return *Your* Lordſhip *thanks, for minding the* Royal Society *of ſo good a way, as they are lately reſolved upon, for the management of a great part of their buſineſs. Wherein, my* Lord, *I do more then preſume, that I alſo ſpeak the ſenſe of the whole* Society; *I think,* *not any one excepted.*

I may with the ſame confidence intimate, my Lord, *how happy they account themſelves, in having a* Perſon *ſo fit to preſide their Affairs, as Your* Lordſhip: *The largeneſs of Your Knowledge, the exactneſs of Your Judgment, the evenneſs* *of Your Comport*; *being ſome of thoſe neceſſary Qualifications, which His* Majeſty *had in His eye,* (*as right well underſtanding what He did*) *when He fixed His choice upon Your* Lordſhip.

I know, my Lord, *that there are ſome men, who have juſt ſo much underſtanding,*

ing, as only to teach them how to be ambitious : the flattering of whom, is ſomewhat like the tickling of Children, till they fall a dancing. But I alſo know, that Your Lordſhip *unconcerneth your ſelf as much, in what I even now ſpake; as* Cæſar *did himſelf, when his* Souldiers *began*

began to ſtyle him King. *For as he ſaid,* Non Rex, ſed Cæſar : *ſo let Your* Lordſhip *be but once nam'd , and all that follows , is but a* Tautology *to what You are already known to be. Your being* Preſident *of the* Royal Society, *Your* be*ing the* firſt *that was choſen , and* choſen *by ſo Wiſe a* King*; amounteth to ſo high and real a* Panegyrick *to Your* Lordſhip, *as maketh verbal ones to be ſuperfluous, and leaves them without any ſound.*

Whence, my Lord, *I have a third Reaſon moſt naturally emergent; which is, that I dare to ſub-*

mit my ſelf, as to what I have hereafter ſaid, to Your Lordſhips *Cenſure. You being ſo able, and juſt an Arbiter, betwixt the ſame and all thoſe perſons therein concern'd; that You can neither be deceived, nor corrupted, to make a Judgment in any Point, to the injury of either.*

And truly, *my* Lord, *were it only from a principle of ſelf-intereſt, yet I could not deſire it ſhould be otherwiſe.* For *the* World, *if it lives*, *will certainly grow as much wiſer then it is*; *as it is now wiſer then it was heretofore.* So *that we have as little reaſon*, *to de-*

ſpiſe Antiquity ; *as we can have willingneſs , that we our ſelves ſhould be deſpiſed by* Poſterity.

Yet ſome difference there is to be made ; viz. *betwixt thoſe of all* Ages*, who have been modeſtly ignorant ; and thoſe who have thought , or pretended , that they were Omniſcient. Or* *if knowing and acknowledging that they were ignorant ; have yet not been contented to be ſo ; unleſs , with as good manners , as ſenſe , they did conjure all Mankind, not to offer at the knowing any more then themſelves.*

Upon the whole , my Lord *, I deſire not You ſhould be* *a* Patron, *any further then You are a* Judge. *For if this ſmall* Eſſay *hath deſerved the leaſt acceptance,* I *am ſure, that in being one, You will be both. Whereby, my* Lord, *You will not a little nouriſh and inſpire my future endeavours of the like nature: being very* *ry ſollicitous to approve. my ſelf,*

My *Lord*,

Your *Lordſhips*

moſt faithful

and obedient

Servant,

Nehemiah Grew.

A
DISCOURSE
Made before the
ROYAL SOCIETY.

HAVING the honour to perform the task of this day; I ſhall endeavour to conform to the *Philoſophy*, which this *Society* doth profeſs; which is, *Ratiocination, grounded upon Experiment, and the Common Notions of Senſe.* The former being, without the latter, too ſubtle and intangible; the latter, without the former, too groſs and unmanageable: but both together, bearing a true analogy to our ſelves; who are neither Angels, nor meer Animals, but Men.

The Subject I have choſen to ſpeak of, is *Mixture.* Whereof, that our *Diſcourſe* may be the more *conſiſtent*, and the better *intelligible*; all I have to ſay, ſhall be ranged into this Method; *viz.*

1. Firſt, I ſhall give a brief account of the received *Doctrine* of *Mixture.*

2: Next, lay down ſome *Propoſitions* of the *Principles* whereof all *Mixed* Bodies conſiſt:

3. Then, open the true

Nature of *Mixture* ; or ſay, *What* it is.

4. And then enumerate the *Cauſes* of *Mixture* ; or ſay, *How* it is made.

5. Laſtly, I ſhall ſhew the *Power* of *Mixture* ; or, *What* it can *do*.

SECT. I.

FIRST, As to the received *Doctrine* of *Mixture* ; not to trouble you with tedious quotations of what *Ariſtotle*, *Galen*, *Fernelius*, *Scaliger*, *Sennertus*, *Riverius* , and others ſay hereof ; we may ſuppoſe the whole ſummed up in that *Definition* which *Ariſtotle* himſelf hath given of it, and which the greater number of his Followers, have almoſt religiouſly adhered to ; *viz.* that 'tis, τῶν μικτῶν ἀλλοιωθέντων ἕνωσις. *Lib.* 1. *de Gener. & Corrupt. Cap. ult.* that 'tis , *Miſcibilium alterato-*

rum unio. Which *Definition,* as it is uſually explicated, is both *Unintelligible,* and *Unuſeful.*

Two things are *unintelligible* ; what they mean by *Alteration* ; and what by *Union.* In this *Alteration,* they ſay, That the very *Forms* of the *Elements* are *alter'd.* And therefore lay it down for an *Axiom, Quòd in Mixto, Formæ Elementares tantum ſint in potentia.* But let us ſee the conſequence.

quence. For if in a *mixed* body, the *Forms* of the *Elements* are but *in potentia*; then the *Elements* themſelves are but *in potentia*: for we all ſay, *Forma dat eſſe*. And if the *Compounding Elements*, are only *in potentia*; then the *Compound Body* it ſelf can be only *in potentia*: yet to ſay it is no more, is moſt abſurd.

As for the *Union* of Elements in a *mixed Body*; they make it ſuch, as brings them at laſt to aſſert, the *Penetration* of *bodies*, and that the *Union* of *mixed bodies* is nothing elſe. For they ſay, it is made in ſuch ſort, that every particle of the *mixed body*, partaketh of the *Nature* of the whole. Which *Nature*, ariſeth from the contemperated *Qualities* of the four E*lements*. Whence they conclude, That every particle of the *mixed body*, containeth in it ſelf all the four E*lements*.

Which is plainly to aſſert a *penetration* of *bodies.* For every E*lement* is, at leaſt, one particle ; if therefore every particle of the mixed body, containeth four E*lements* ; then four particles, are but one. I conclude then, That the received *Doctrine* of *Mixture*, is *Unintelligible.*

Whence it follows, That it is alſo *Barren* and *Unuſeful.* For who can make any uſe of that which he underſtandeth not ? And the experience of ſo many years, wherein it hath been ventilated by the diſputes of men, proveth as much: Scarce any of them, except the Learned *Sennertus*, daring to venture upon Experiment , for fear they ſhould come to underſtand themſelves.

It is confeſſed, that many gallant things have been found out by artificial *Mixture.* But no thanks to this

Definition of it. For as an *Ignorant* Perſon may make bad *Work*, and a good *Rule* be never the worſe; ſo an *Ingenious* Perſon may make good *Work*, and a bad *Rule* be never the better. The queſtion is not, what have men done? but what have they done upon this foundation, *Quòd Mixtio ſit miſcibilium alteratorum unio.* Had this ever taught them to do any thing, even ſo much as to make the *Ink* wherewith they have wrote all their *Diſputes*; I confeſs, they would have had ſomething to ſhew for it. But the truth is, their *notions* of *Mixture*, have been ſo far from doing us any good, that they have done us much harm: being, through their ſeeming ſubtlety, but real abſurdity, as ſo many phantaſtick Spectrums, ſerving only to affright men from coming near them, or the Subject whereof they treat.

I

I ſhall therefore endeavour to open the true *Nature* of *Mixture*. And I ſhall build my *Doctrine* upon the *Common Notions* of *Senſe*: which none can *deny*; and every one may *conceive* of. In order to which, I ſhall take leave to lay down ſome *Propoſitions*, of the *Principles* of all *mixed bodies*.

SECT.

SECT. II.

1. AND firſt, by *Principles*, I mean *Atomes*, or certain *ſorts* of *Atomes*, or of the *ſimpleſt* of *Bodies*. For otherwiſe they would not be *Principles*; for a *compounded Principle*, in ſtrict ſpeaking, is a *contradiction*. Even as *fives*, *threes*, or *twos*, are not the *Principles* of *Number*, but *Unites*.

2. Whence, ſecondly,

it follows, that they are alſo *Indiviſible*. Not *Mathematically*; for the *Atomes* of every *Principle* have their *dimenſions*. But *Phyſically*; and ſo, what is but *one*, cannot be made *two*.

If it be asked, Whether a Stick cut with a Knife, be not of one, made two? I ſay, that a Stick, is not *one* body, but *many millions* of bodies; that is, of *Atomes*; not any one whereof is *divided* within it ſelf, but only they are *ſeparated* each from other, where the Knife forceth its way. As in the drawing of a mans Finger through an heap of Corn; there is no *diviſion* made in any one *Grain*, but only a *ſeparation* of them one from another, all remaining ſtill in themſelves entire. I ſay therefore, that what is *phyſically one*, is alſo moſt firm, and *indiviſible*; that is, *impenetrable*: for *penetration* is but the *ſeparation*, not the *diviſion* of *Atomes.*

3. Hence, thirdly, they are alſo *Immutable.* For that which cannot be *divided*, cannot be *chang'd.* So that of the whole World of *Atomes*, not any one hath ever ſuffer'd, or can ſuffer the leaſt *mutation.*

Hereupon is grounded the *Conſtancy* of *Cauſes* and *Effects.* So that, in all *Generations*, it is not leſs certain , that the ſelf ſame

Principle is ſtill *propagated* from the ſame ; than, that M*an* is from *Man*. Wherefore , *Compounded* bodies are *generated* ; but *Principles* are not, but only *propagated* ; that is, in every *Generation* , they paſs , in themſelves unaltered, from one body,into another.

4. If *Principles*, or *Atomes* are all *Immutable* ; it again follows , That they are of *divers kinds*. For one and the ſame *Principle*,

or *kind* of *Atomes*, will ſtill *make* the *ſame* thing, and have the *ſame effect* : ſo that all *Generations* would then be the *ſame*. Wherefore, ſince they are *Immutable* , they muſt be *divers*.

5. This *diverſity* , for the ſame reaſon , is not ſmall, but very *numerous*. For as the *World*, taken together , is *Natures Shop* ; ſo the *Principles* of Things, are her *Tools*, and her *Materials*.

terials. Wherefore, as it ſpeaks the *goodneſs* of a *Shop*; ſo the *perfection* of the *Universe*, That it is furniſhed with many *Tools* wherewith, and many *Materials* whereupon to *work*. And conſequently, that *Philoſophy* beareth beſt its own name; which doth not ſtrain all to two or three *Principles*, like two or three Bells in a Steeple, making a pittiful *Chime*: but tryeth to riſe up to *Natures* own *number*, and ſo to *ring* all the *changes* in the world.

6. Yet doth not this vaſt *Diverſity*, take away the *Regiment* and *Subordination*, of *Principles*. There being a certain leſſer *number* of them, which either by their greater *quantity*, or other ways, have *Rule* and *Dominion*, in their ſeveral *Orders*, over all the reſt. For where-ever the *Subject* is *Multitude*, *Order*

is part of its *Perfection.* For *Order* is *Proportion.* And how can *Nature* be imagin'd to hold *Proportion* in all things elſe, and not here? Wherefore, as certainly, as *Order* and *Government* are in all the parts of the *Rational*; ſo certainly, of the *Material World.*

Whence it is, That although the *Species* of *Principles* be very *numerous*; yet the *Principles* called *Galenical*, *Chymical*, or any others, which do any way fall under the notice of Senſe, are notwithſtanding *reduceable* to a *ſmaller number*: *viz.* according to the *number* of *Predominant Principles* in *Nature*; or, at leaſt, in this part of the *Univerſe* which is *near and round about us.* To the *Power* and *Empire* whereof, all other *Principles* do ſubmit. Which *Submiſſion*, is not the *quitting* of their own *Nature*; but only their ap-

appearance under the external Face or *Habit* of the ſaid *Predominant Principles.*

7. As there can be no *Order* of *Principles*, without *Diverſity* ; ſo no *Diverſity*, but what is *originally* made by theſe two ways ; *ſc.* by *Size* and *Figure*. By *theſe* they may be exceeding different: and all other *Properties* beſides , whereby they differ , muſt be *dependent* upon *theſe two.*

8. Nor therefore, can they be of any other *Figures*, than what are *Regular*. For *Regularity*, *is a Similitude continu'd*. Since therefore all kinds of *Atomes* are *divers* only by their *Size* and *Figure*; if the ſelf ſame *Size* and *Figure* were not *common* to a certain number of *Atomes*, they could not be ſaid to be of any *one kind*: and conſequently, if there were no *Similitude* of *Atomes*,

there could be no *Diſtinction* of *Principles.*

9. Hence alſo, theſe two *Modes* of *Atomes*, *viz.* their *Size* and *Figure*, are the true, and only *original Qualities* of *Atomes.* That is, an *Atome* is *ſuch* or *ſuch*, becauſe it is of ſuch a certain *Size* and *Figure.*

10. Laſtly, As theſe two *Modes*, taken ſeverally, are the *Qualities* of an *Atome*: ſo conſider'd together, they are its *Form.*

A *ſubſtantial Form* of a *Body*, being an unintelligible thing. I ſay of a *Body*; for although the *Rational Soul* be a *ſubſtantial Form*, yet is it the *Form* of a *Man*, and not of a *Body*. For the *Form* of a *Body*, we can conceive of no otherwiſe, then as of the *Modification* of a *Body*, or a *Complexion* of all the *Modes* of a *Body*. Which alſo agrees with that *Definition* of a *Form*, which amongſt the

Peripatetick Philoſophers is well enough accepted, *viz.* *Quod ſit, Ratio ejus Eſſentiæ, quæ cuique Rei competit.* Which *Ratio*, if it be referred to a *Body*, what is it but the *Modification* of that *Body*? Having thus propoſed a Summary of my *Thoughts* about *Principles*; I ſhall next proceed to ſhew what their *Mixture* is.

SECT. III.

AND firſt of all, from the *Premiſſes*, we arrive at this *Concluſion* ; *ſc.* That the *Formation* and *Transformation* of all Bodies, can be nothing elſe, but the *Mixture* of Bodies. For all *Principles* are *immutable*; as we have above proved : and therefore not *generable*, *formable*, or *transformable*. And the *Forms* of

Principles, being but thei *Modes*, are alſo *immutable.* So that the whole *Buſineſs* of the *Material World*, is nothing elſe , but *Mixture.*

Again, as *Nature* worketh every where only by *Mixture* ; ſo is this *Mixture* every where but *one thing*, and can be but *one*. For whether it be the *Mixture* of *great* Bodies, or of *ſmall*; of *Compounds*, or of *Atomes*; it is every where *Mixture*, and the *Mixture* of *Bodies*. Whereſore, *Mixture* is either an *intelligible Affection* of *all* Bodies, or of *none*; which latter, no man will ſay. As many wayes, therefore, as we can *ſee*, or *conceive* the *Mixture* of any *groſs* Bodies, which we hold in our hand; ſo many ways, we may, of the *ſubtileſt Mixtures* which *Nature* maketh, or of *Atomes* themſelves; and no other wayes.

Now all the wayes we can diſtinguiſh *Mixture* by, are in general theſe *two*; either in reſpect of the *Bodies Mixed*, or elſe of the Modes of the Mixture it ſelf.

In reſpect of the *Bodies Mixed*, Mixture is diſtinguiſhed alſo *two* ways ; *viz.* by *Conjugation*, and by *Proportion*.

By *Conjugation*, I mean, a *Certain* Mixture *of ſome ſuch* Principles , *and not of others.*

others. Which is *three-fold.*

Firſt, As to *Number*: as when one Body may be compounded of *two Principles*, another of *three*, a third of *four*, a fourth of *five*, and ſo on.

Secondly, As to *Kind*: where, though there be a conjunction of the ſame *Number*, yet not of the ſame *Kind.*

Thirdly, When they differ from one another both in *Number* and *Kind.*

So many ways the *Principles* of Bodies may be conceived to be *Conjugated*; and therefore are : for here, that which *may* be, *is*. The Conſequence is clear. For *firſt*, *Nature* hath various *Materials* wherewith to make theſe *Mixtures* ; as we have ſhew'd. *Secondly* , By theſe *Mixtures* ſhe *may*, and without the concurrence of any imaginary *Forms*, *muſt* produce all the varieties in the *material world*; as likewiſe hath been ſaid. Wherefore, ſince all imaginable *Mixtures may* be *made*, and that to *ſome purpoſe*; if they ſhould not be *ſo*, *Nature* would be *Imperfect*: becauſe we our ſelves can think, how ſhe might put her *Materials* to further uſe , then *ſo* ſhe would do.

To think , therefore, that all *kinds* of *Principles*, or all *Elements* go to make up every *Compounded Body*; is a conceit, no more to be credited, then one that ſhould tell us, all *kind* of *Wheels* and other *parts* of a *Watch*, were put into a *Clock*; or that there were no other *Materials* wherewith to build an *Houſe*, then for a *Tent* or a *Ship*. For why ſhould *Nature*, the great *Artificer* by which all *perfect Works* are made, be feigned to cram and ram *all things into one*, which we our ſelves look upon as abſurd ?

Secondly, The *Mixture* of *Principles* is diverſifi'd, as by *Conjugation*, ſo alſo by *Proportion*. That is, by the divers *Quantities*, of the ſeveral *Principles* or *Parts mixed* together.

As if the *quantity* of one, were as *five* to *ten*; of a ſecond, as *five* to *fifteen*; of a third, as *five* to *twenty*, &c.

Or if that of one, be as *five* to *ſix*; of a ſecond, as *ſix* to *ſeven*; of a third, as *ſeven* to *eight*. By which, and by other *Proportions*, *Mixture* may be varied innumerable ways.

Again, As *Mixture* is varied with reſpect to the *Bodies Mixed*; ſo likewiſe in reſpect of the *Mixture* it ſelf, which I call the *Location* of *Principles*, or the *Modes* of their *Conjunction*. Which may be various, as well as their *Conjugation* and *Proportion*. Yet are they all reduceable unto *two* general *Modes* : all *Bodies* , and therefore all *Principles* , being *Mixed*, either by *Mediation*, or by *Contact*.

Now all *Contact* , whether of *Compounds*, or of *Atomes*, can be no other way, then ſuch as is anſwerable to their *Figures*. Whereof , therefore , we can conceive but *three* general ways, *viz.* *Firſt*,

Firſt, By *Contact* in a Point, or ſome *ſmaller part*: as when *two Atomes* meet, which are *globular* or otherwiſe *gibboſe*.

Secondly, By *Contact* in a P*lain*: as in the conjunction of the *ſides* of *Triangular* or *Quadrangular Atomes*, or otherwiſe *flat*.

Thirdly, By *Contact* in a *Concave*: as when one *Atome* is admitted into the *Concave* or *hole* of another; as a Spigot is into a Foſſet.

The *firſt* may be called, *Appoſition* ; the *ſecond*, *Application* ; the *third* , *Reception* or *Intruſion*.

In the *two laſt* wayes, *Atomes* may be joyned by *Mediation* ; but beſt of all the *laſt*. As when the *two extreams* of one *Atome* are received into the *Concaves* or the *holes* of two others.

And these are all the *general* ways, whereby we can conceive Bodies to be

Mixed together; *ſc.* by their various *Conjugation*, *Proportion*, and *Location*.

So that the *Compoſition* of *Atomes*, in *Bodies*; is like that of *Letters*, in *Words*. What a Thunder-clap would ſuch a *Word* be, as wherein all the four and twenty *Letters* were pack'd up? One therefore is compounded of more, another of fewer; this of ſome, and that of others: and both the *Conjugation*, *Pro-*

portion , and *Location* of *Letters* is varied in every *Word*: whereby, we have many thouſands of *differing Words*, without any *alteration* at all, in the *Letters themſelves*; and might have ten times as many more. In like manner, therefore, or in the ſelf ſame analogous way, as the *Letters* of the *Alphabet* , are the *Principles* of *Words*; ſo *Principles*, are the *Alphabet* of *Things*.

What we have ſaid of *Principles* ; and of *Mixture* as conſequent thereupon; may be a *foundation* for an *intelligible* account, of the *Nature* and *Cauſe* of moſt of the Intrinſick *Properties*, and *Qualities* of *Bodies* : as of *Gravity*, *Levity*, *Fixity*, *Fluidity*, *Angularity*, *Roundneſs*, *Heat*, *Cold*, *Blackneſs*, *Whiteneſs*, *Sowerneſs*, *Sweetneſs*, *Fragrancy*, *Fetidneſs*, and very many more. I ſay an *intelligible* account ;

ſc. ſuch as is grounded upon the *Notions* of *Senſe*, and made out *Mechanically*. But the exemplification hereof, being too large a field for this, or any one *Lecture*, I ſhall, before I come to the *Cauſes* of *Mixture*, only deduce from the *Premiſſes*, theſe following *Corollaries*.

1. *Firſt*, That there is no *alteration* of *Principles* or of *Elements*, in the moſt *perfect Mixture* of Bodies.

It *cannot* be ; for *Principles* are *Immutable*, as we have ſaid. And if it could be, yet it *needeth not* to be: for they are alſo *many*, and *compoundable infinite* ways; as hath been ſhewed. So that we have no need to perplex our ſelves with any of thoſe difficulties, that ariſe from the *Doctrine* of the *Alteration* of *Elements*. The ground of which conceit, is that, of there being but four *Elements*, and that all the *Elements* muſt needs be in every *Body*. And ſo men being puzled, how from thence to make out the infinite *variety* of Bodies, they feigned them to be alterable, and *alter'd*, upon every *perfect Mixture*. Not conſidering, that if their four *Elements* be *alterable*; as few as they are, no fewer then *three* of them may be ſpared: for *one Element*, if *alterable*, may be made *any*.

2. Hence, *ſecondly*, may be ſolved that great *Diſpute*, Whether ſuch as we call *Lixivial Salts*, are *made* by the *fire*?

For *firſt*, No P*rinciple* is *made* by the *fire*: all P*rinciples* being *unalterable*; and therefore *unmakeable*.

Secondly, We muſt therefore diſtinguiſh betwixt the P*rinciple*, and the *Modification* of a P*rinciple*; or its various *Mixture* with other *Principles*, whence it may receive a various *denomination.*

Wherefore, a *Lixivial Salt*, *qua Lixivial*, is certainly *made* by the *fire*. But *quatenus Salt*, it is not: that *Principle* being *extractable* out of *moſt* Bodies ; and by *divers* other *ways*, then by the *fire*. For whether you *Calcine* a body, or *Ferment* it, (after the manner ſhew'd by the *diligent* and *curious Improver* of *Chymical* Knowledg, *Dr.*

Daniel Coxe) or elſe *putrifie* it under ground, or *drown* it in the Sea; it ſtill yieldeth *ſome kind* of **Salt.** All which *Salts* are *made*, not by *making* the *Saline Principle*; but only by its being *variouſly Mixed*, upon thoſe various ways of the *Solution* of Bodies, with other *Principles*: from which its *various Mixture*, it receives the *various Denominations*, of *Marine*, *Nitrous*, *Volatile*, or *Lixivial*.

3. Hence, *thirdly*, the moſt

perfect Mixture of Bodies, can go no higher then *Contact*. For all *Principles* are *unalterable*;and all *Matter* is *impenetrable* ; as hath been ſaid. In the moſt *viſible* and *laxe Mixture*, there is *Contact* ; and in the moſt *ſubtile* and *perfect*, as in *Generation* it ſelf,there is *nothing more*.

4.Hence,*fourthly*,we eaſily underſtand,how divers of the ſame *Principles*, belonging both to *Vegetables* and many *other* Bodies, are alſo *actually* exiſtent in the Body of *Man*. Becauſe even in *Generation*, or *Tranſmutation*, the *Principles* which are tranſlated from one body to another, as from a *Vegetable* to an *Animal*, are not in the leaſt *alter'd* in themſelves; but only their *Mixture*, that is, their *Conjugation*, *Proportion*, and *Location*, is *varied*.

5. Hence alſo the difference of *Mixture*, ariſing from the difference of *Contact*, is intelligible; *ſc.* as to

thoſe *three degrees*, *Congregation*, *Union*, *and Concentration*.

Congregation, and *Inconſiſtent Mixture*, is when the ſeveral *Atomes* touch but in a *Point*, or *ſmaller part*. In *which* manner, I have divers arguments, inducing me to believe the *Atomes* of all *Fluid Bodies*, *qua Fluid*, do touch; and in *no other*.

Union, is when they touch in a *Plain*. As in the *Cryſtals* and *Shootings* of all *Salts*, and *other* like Bodies. For if we purſue their divided, and ſubdivided parts, with our eye, as far as we can; they ſtill *terminate*,on every ſide,in *Plains.* Wherefore, 'tis intelligible, That their very *Atomes* do alſo *terminate*, and therefore *touch*, in *Plain.*

Concentration,is when two, or more *Atomes* touch by *Reception* and *Intruſion* of one into another: which is the *cloſeſt*, and *firmeſt Mixture* of all; as in any *fixed*, *un-*

unodorable,or *untaſtable* body: the *Atomes* of ſuch bodies,being not able to make any *Smell* or *Taſt*, unleſs they were firſt *diſſolved*;that is to ſay, *unpin'd* one from another.

6. Hence,*ſixthly*,we underſtand, how in ſome caſes, there ſeemeth to be a *Penetration* of *Bodies*;and in what *ſenſe* it may be admitted: *viz.* if we will mean no more by *Penetration*,but *Intruſion*. For the *Intruſion* of one *A-*

come into the *Concave* or *hole* of another, is a *kind* of *Penetration*;whereby they take up leſs room in the *mixed* Body, then they would do by any other way of *Contact*. As a naked knife and its ſheath, take up almoſt double room, to what they do , when the knife is ſheathed.

Whence we may aſſign the *reaſon*, Why many *Liquors* being *mixed* ; take up leſs room or ſpace,thenthey did *apart* ;

apart ; as the very *Ingenious* M. *Hook* maketh it to appear by *Experiment* that they do. I ſay the plain *reaſon* hereof, or at leaſt one reaſon, is the *Intruſion* of many of their *Atomes* one into another. Which yet is not a *Penetration* of Bodies ſtrictly ſo called.

7. If all that *Nature maketh*, be but *Mixture*; and all this *Mixture* be but *Contact*: 'tis then evident, That *Natural* and *Artificial* Mixture,

are

are the *ſame*. And all thoſe *ſeeming ſubtilties* whereby *Philoſophers* have gone about to *diſtinguiſh* them ; have been but ſo many *Scarcrows*, to affright *Men* from the *Imitation* of *Nature*.

8. *Laſtly*, Hence it follows, That *Art* it ſelf may go far in doing what *Nature* doth. And who can ſay, how far ? For we have nothing to *Make* ; but only to *Mix* thoſe *Materials*, which are already *made* to our

hands. Even *Nature* her ſelf, as hath been ſaid, *Maketh* nothing *new*; but only *Mixeth* all things. So far, therefore, as we can govern *Mixture*, we may do what *Nature* doth.

Which, that we may ſtill the better underſtand; let us before, and in the next place, ſee the *Cauſes* of *Mixture*. For ſince *Natural* and *Artificial* Mixture are the *ſame*; the *immediate Cauſes* of both, are and muſt be the *ſame*.

SECT. IV.

NOW all the *Cauſes* of *Mixture* we can conceive of, muſt, I think, be reduced to theſe *ſix* in *general*; *viz.* *Congruity*, *Weight*, *Compreſſion*, *Solution*, *Digeſtion*, and *Agitation.*

1. *Congruity*, or aptitude and *reſpondence* betwixt the *Sizes* and *Figures* of *parts* to be *mixed* : whereby bodies may be truly called the *Inſtrumental Cauſes* of their

own Mixture. As when a *plain* anſwers to a *plain*, a *ſquare* to a *ſquare*, a *convex* to a *concave*, or a *leß* to a *greater* or an *equal*,&c. according to which *Reſpondencies* in the *parts* of Bodies, they are more or leſs eaſily *mingleable*.

2.*Weight*;by means whereof, all *Fluid* Bodies, upon ſuppoſition of the *Congruity* of their parts, muſt unavoidably *mingle*

3.*Compreſſion*;which either

by the *Air*, or any other body, added to *Weight*, muſt, in ſome degree, further *Mixture*. Becauſe, that *Weight* it ſelf is but *Preſſion*.

For further proof of all the ſaid *Cauſes*, I made this *Experiment*: Let *Oyl* of *Aniſeſeeds*, and *Oyl* of *Vitriol* be put apart into the *Receiver* of an *Air-Pump*. And, having *exhauſted* it of the *Air*, let the *two* ſaid *Oyls* be then affuſed one upon the other. Whereupon

Firſt, It is viſible, that they here *mix* and *coagulate* together; that is, their parts are *wedged* and *intruded* one into another, without the *uſual compreſſion* of the *Air*; for that is *exhauſted*: and therefore only, by the *Congruity* of their receiving and intruding parts; and by their *Weight*; by *which* alone they are ſo *compreſſed*, as to make that *Intruſion*.

Secondly, It is alſo evident, That although they do *Co-*

agulate ; yet not altogether ſo much, as when powred together in the ſame manner, and quantity, in the *open Air*. Wherefore, *Compreſſion* , whether made by the *Air*, or any thing elſe, doth ſomewhat further the *Mixture* of Bodies, and the greater the *Compreſſion*, the more.

4. *Solution*; For all bodies *mix* beſt, in *Forma fluida*. And that for two reaſons.

Firſt, Becauſe the *parts* of a body are not then in a *ſtate* of *Union*, but of *Separation*; and therefore, in a more capable *ſtate*, for their *Mixture* and *Union* with the *parts* of *another* body.

Secondly, Becauſe then they are alſo in a *ſtate* of *Motion*, more or leſs; and therefore, in a continual tendency towards *Mixture*; all *Mixture* being made by M*otion*.

Wherefore, all G*enerations*, and moſt *perfect* Mi*xtures* in *Nature*, are made by *Fluids*; whether *Animal*, *Vegetable*, or

Mineral. Which is alſo agreeable to the *Doctrine* of the *Honourable* Mr. *Boyle*, in his *excellent Treatiſe* of the *Nature* and *Vertues* of *Gems.*

And 'tis well known, That bodies are ordinarily *petrified*, or *Stones made*, out of *Water*. That is, out of *petrifying parts* diſſolved *per minima* in *Water*, as both their *Menſtruum* and their *Vehicle.* Wherefore, if we will talk of *making Gold*; It muſt not be by the Philoſophers *Stone*, but by the Philoſophers *Liquor.*

5. *Digeſtion.* For which there is the ſame reaſon, as for *Mixture*, by *Solution*. For *Firſt*, All heat doth *attenuate*, that is, ſtill further *ſeparate* the *parts* of a body; and ſo render them more *mingleable* with the *parts* of *another*. And therefore *Secondly*, Doth alſo add more *Motion* to them, in order to their *Mixture.*

6. *Agitation.* Which I am in-

induced to believe a great and effectual means of *Mixture*, upon divers conſiderations. As

Firſt, That the *making* of *Blood* in the *Bodies* of *Animals*, and the *mixing* of the *Chyle* therewith, is very much promoted by the ſame means; *ſc.* by the *Agitation* of the parts of the *Blood* and *Chyle*, in their continual *Circulation*.

Again, From the *making* of *Butter* out of *Milk*, by the ſame means: whereby alone is made a *ſeparation* of the oleous parts from the whey, and a *mixture* of them together.

Moreover, From the great *Effects* of *Digeſtion*; well known to all that are converſant in *Chymical Preparations*. Which *Digeſtion* it ſelf, is but a *kind* of *inſenſible Agitation* of the *parts* of *digeſted* bodies.

'Tis *alſo* a known *Experiment*, That the readieſt way to diſſolve *Sugar* in *Wine* or other *Liquor*; is to give the *Veſſel* a *haſty turn*, together with a *ſmart knock*, againſt any *hard* and *ſteady* body: whereby all the parts of the *Sugar* and *Liquor*, are put into a vehement *Agitation*, and ſo immediately *mixed* together.

And I remember, that having (with intent to make Mr. *Mathews*'s *Pill*) put ſome *Oyl* of *Turpentine* and *Salt* of *Tartar* together in a bottle, and ſent it up hither out of the *Country*; I found, that the continual *Agitation* upon the *Road*, for three or four days, had done more towards their *Mixture*; then a far greater time of *Digeſtion* alone had done before. And it is certain, That a vehement *Agitation*, eſpecially if continu'd, or joyned with *Digeſtion*; will accelerate the *Mixture* of ſome bodies, ten times more, then any bare *Digeſtion* alone; as may be proved by many *Experiments.*

I will inſtance in this one. Let ſome *Oyl* of *Turpentine* and good *Spirit* of *Nitre* be ſtop'd up together in a bottle, and the bottle held to the fire, till the *Liquors* be a little heated, and begin to bubble. Then having removed it, and the Bubbles by degrees increaſing more and more; the two *Liquors* will of themſelves, at laſt fall into ſo impetuous an

Ebullition, as to make a kind of *exploſion*; ſending forth a *ſmoak* for the ſpace of almoſt *two yards* high. Whereupon, the *parts* of both the *Liquors*, being violently *agitated*, they are, in a *great portion*, *incorporated* into a *thick Balſam* in a *moment*: and that without any *intenſe* heat, as may be felt by the bottle. And thus much for the *Cauſes* of *Mixture*.

SECT. V.

HAVING enumerated the *general Cauſes*, we ſhall, laſtly, enquire into the *Power* and *Uſe* of *Mixture*; or, into what it can *Do* and *Teach*. And I ſhall Inſtance in *ſix* particulars.

Firſt, To Render all Bodies *Sociable*, whatſoever they be.

Secondly, To *Make Artificial* Bodies in Imitation of thoſe of *Natures* own production.

Thirdly, To *Make* or *Imitate* the *ſenſible Qualities* of Bodies; as *Smells*, and *Taſts*.

Fourthly, To *Make* or *Imitate* their *Faculties*.

Fifthly, It is a *Key*, to diſcover the *Nature* of Bodies.

Sixthly, To diſcover their *Vſe*, and the *Manner* of their *Medicinal Operation*.

Inſtance I.

FIRST, To render all Bodies *Sociable* or *Mingleable*: as *Water* with *Oyl*, *Salt* with *Spirit*, and the like. For *Natural* and *Artificial Mixture*, are the ſame; as we have before proved. If therefore *Nature* can do it, as we ſee in the *Generation* of bodies ſhe doth; 'tis likewiſe in the *Power* of *Art* to do it.

And for the doing of it, two *general Rules* reſult from the *Premiſſes, ſc.* The *Application* of *Cauſes*, and the *Choice* of *Materials*. As for the *Cauſes*, they are ſuch as I have now inſtanc'd in. And for the *Application* of them, I ſhall give theſe *two Rules*.

Firſt, That we tread in *Natures* ſteps as near as we can; not only in the *application* of ſuch a *Cauſe*, as may be moſt proper for ſuch a *Mixture*; but alſo in allowing it *ſufficient time* for its *effect*. For ſo we ſee *Nature* her ſelf, for her more *perfect Mixtures*, uſually doth. She maketh not a *Flower*, or an *Apple*, a *Horſe*, or a *Man*, as it were in a *moment*; but all things *by degrees*; and for her more *perfect and elaborate Mixtures*, for the moſt part, ſhe requireth *more time*. Becauſe all ſuch *Mixtures* are made and carri'd on *per minima*; and therefore require a greater time for the compleating of them.

A *ſecond Rule* is, Not only to make a due *Application* of the *Cauſes*; but ſometimes to *Accumulate* them. By which means, we may not only *Imitate Nature*, but in ſome caſes go beyond her. For as by adding a *Graft* or *Bud* to the *Stock*, we may produce *Fruit ſooner*, and ſometimes *better*, then *Nature* by the *Stock* alone would do: So here, by *accumulating* the

Cauſes of *Mixture*;that is,by joyning *three*,or *four*,or *more* together; or by *applying more* in ſome caſes,where *Nature* applyeth *fewer* ; we may be able to make, if not a more *perfect*, yet a far more *ſpeedy Mixture*, than *Nature* doth. As by joyning *Compreſſion*, *Heat*,and violent *Agitation*, and ſo continuing them all together, by ſome means contrived for the purpoſe, for the ſpace of a *week*, or *moneth*, or *longer*, without ceſſation. Which may probably produce, not only *ſtrange*, but *uſeful effects*, in the *Solution* of ſome, and the *Mixture* of other Bodies. And may ſerve to *mix* ſuch Bodies, as through the *ſmall number* of their *congruous* parts, are hardly *mingleable* any other way. *Agitation* being, as carrying the *key* to and fro, till it hit the *lock*; or within the *lock*, till it hit the *wards*.

Secondly, For the *Choice* of

Materials, if they are not *immediately*, that is, of themſelves, *mingleable*; we are then to turn one *ſpecies* of *Mixture* into a *Rule*; which is, To *mix* them by *mediation* of ſome *third*, whether more *ſimple* or *compounded* body, which may be congruous *in part* to them *both*: as *ſulphurious Salts* are to *Water* and *Oyl*; and are for that reaſon *mingleable* with *either* of them.

Or, By any *two* congruous

Bodies, which are alſo, *in part*, congruous to *two others*: and other like ways. Whereby the *parts* of Bodies, though never ſo *heterogeneous*, may yet be all *bound* and *lock'd* up together. Even as *twenty keys* may be *united*, only by *uniting* the *two Rings* whereon they hang.

The conſideration of theſe things, have put me upon making ſeveral *Experiments*, for the *Mingling* of *heterogeneous* Bodies. I ſhall give two Ex-

Examples of tryal; the one upon *fluid*, the other upon *conſiſtent*, Bodies.

For the *firſt*, I took *Oyl* of *Aniſe-ſeeds*, and powring it upon another Body; I ſo order'd it, that it was thereby turned into a perfect *milk-white Balſam*, or *Butter*. By which means the ſaid *Oyl* became *mingleable* with any other *Liquor*, *Oyl*, *Wine*, or *Water*; *eaſily*, and *inſtantaneouſly diſſolving* therein, in the form of a *Milk*. And *note*, That this is done, without the *leaſt alteration* of the *ſmell*, *taſt*, *nature* or *operation* of the ſaid *Oyl.*

By ſomewhat the like means, not only *Oyl* of *Aniſe-ſeeds*, but any other *ſtillatitious Oyl*, may be transformed into a perfect *milk white Butter*; and in like manner be *mingled* with *Water* or any other *Liquor*. Which is of *various uſe* in *Medicine*; and what I find oftentimes very convenient and advantageous to be done.

Again, Not only *fluid* but *conſiſtent* bodies, which of themſelvs will *mix* only with *Oyl*; by due *mixture* with other bodies, may be render'd *eaſily* diſſoluble in *Water*; as may *Roſin*, and all *reſinous* and *friable Gums*. As alſo *Wax*: and this without changing much of their *Colour*, *Taſt* or *Smell*. Whereof likewiſe, whatſoever others may do, the *Phyſician* may make a manifold *Vſe*.

Inſtance II.

BY *Mixture* alſo, we may be *taught* to *Imitate* the *Productions* of *Nature.* As to which, from what we have before ſaid of *Mixture*, we may conclude; That there is no *generation* of Bodies *unorganical*, but what is in the *power* of *Mixture* to *imitate.* As of *Animals*, to Imitate *Blood*, *Fat*, *Chyle*, *Spittle*, *Flegm*, *Bile*, &c. Of *Vegetables*, to Imitate a *Milk*, *Mucilage*, *Roſin*, *Gum*, *or Salt*. Of *Minerals*,

rals, to Imitate *Vitriol*, *Allom*, and other *Salts*; as alſo Metals, and the like.

I do not ſay, I can do all this: but if upon good *premiſſes* we may conclude this *may* be done; it is one ſtep to the doing of it. But I will alſo give an *Inſtance* of ſomewhat that may be *done* in every *kind*. And

1. *Firſt*, For the *Imitation* of an *animal body*, I will inſtance in *Fat*. Which may be *made* thus; Take *Oyl Olive*,

live, and powr it upon high *Spirit* of *Nitre*. Then *digeſt* them for ſome days. By degrees, the *Oyl* becomes of the *colour* of M*arrow*; and at laſt, is *congealed*, or hardned into a *white Fat* or *Butter*, which *diſſolveth* only by the *fire*, as that of *Animals*.

In converting *Oyl* thus into *Fat*, it is to be *noted*, That it *hardens* moſt upon the *exhalation* of ſome of the more *Sulphureous* parts of the *Spirit* of *Nitre*. Which I effected, well enough for my purpoſe, by unſtopping the glaſs after ſome time of *digeſtion*; and ſo ſuffering the *Oyl* to *diſſolve* and *thicken* divers times by ſucceſſive *heat* and *cold*.

Hence, The true *Congealing Principle*, is a *Spirit of Nitre ſeparated from its Sulphur*. For the better doing whereof, the *Air* is a moſt commodious *Menſtruum* to the ſaid *Spirit* of *Nitre*.

Whence alſo, if we could

procure ſuch a *Spirit* of *Nitre*, we might *congele Water* in the midſt of *Summer*. We might alſo *refrigerate Rooms* herewith *artificially*. And might *Imitate* all *froſty Meteors*. For the *making* of *Fat*, is but the *Durable Congelation* of *Oyl*; which may be done without *froſt*, as I have ſhew'd how.

Hence alſo it appears, That *Animal Fat* it ſelf, is but the *Curdling* of the *Oily* parts of the *Blood*; either by ſome of its own *Saline* parts; or by the *Nitrous* parts of the *Air* mingled therewith.

Hence likewiſe it is, That ſome *Animals*, as *Conies*, and *Fieldfares*, grow *fatter* in *froſty* weather: the *oily* parts of the *blood*, being then more than ordinarily *coagulated* with a greater abundance of *nitrous* parts received from the *Air* into their *bodies*.

For the ſame reaſon it is, That the *Fat* of *Land-Animals* is *hard*; whereas that of

Fiſh is *very ſoft*, and in a great part runs to *Oyl*, *&c.* Becauſe the *Water*, wherein they live, and which they have inſtead of *breath*, hath but very few *nitrous* parts in it, in compariſon of what the *Air* hath.

2. For the *Imitation* of a *Vegetable Body*, I will give three *Inſtances*; In *Roſin*, *Gum*, and a *Lixivial* Salt. The *firſt* may be made thus; Take good *Oyl* of *Vitriol*, and drop it upon *Oyl* of *Aniſe-ſeeds*; and they

will forthwith *incorporate* together; and by degrees, will *harden* into a *perfect Roſin*; with the *general* and *defining Properties* of a *truly Natural Reſinous Gum.* Being not in the leaſt *diſſoluble* in *Water*; or at leaſt, not any more, then any natural *Roſin* or *Gum*: yet very *eaſily* by *fire*: as alſo highly *inflammable*: and exceeding *friable.*

Although this *artificial roſin*, be the reſult of *two Liquors*, both which very ſtrongly affect the *Senſe*: yet being well *waſhed* from the *unincorporated parts*, (which is to be done with ſome care) it hath ſcarce any *Taſt* or *Smell.*

The *Concentration* of theſe *two Liquors*, is likewiſe ſo *univerſal*; that the *Roſin* is not made by *Precipitation*, but almoſt a *total Combination* of the ſaid *Liquors*; and that with ſcarce ſo much, as any *viſible* fumes:

Again, Having taken a certain *Powder* and a *Saline Liquor*,

quor, and mixed them together in a bottle, and ſo *digeſted* them for ſome time; the *Powder* was at laſt tranſmuted to a perfect *Oily Gum*; which will alſo *diſſolve* either in *Oyl*, or in *Water*; in the ſelf ſame manner, as *Galbanum*, *Ammoniac*, and the like will do.

And *Laſtly*, A *Lixivial* Salt may be *imitated* thus; Take *Nitre*, *Oyl* of *Vitriol*, and high Spirit of *Wine*, of each a like quantity. Of theſe *three* Bodies,

dies, not any *two* being *put together* ; that is to ſay, neither the *Nitre* with the *Oyl*, nor the *Oyl* with the *Spirit*, nor the *Nitre* with the *Spirit*; will make the *leaſt ebullition* : yet all *three mingled together*, make a very *conſpicuous one*. The *Spirit* of *Wine* being as the *Sulphur*;and ſo that,and the *Nitre* together, ſtanding, as it were, in the ſtead of an *Alkalizate*, that is,a *Sulphurious Salt*, againſt the *Oyl* of *Vitriol*. Divers other *Experiments* I can ſhew of the like nature.

3. In the laſt place, for the *Imitation* of a *Mineral Body*, I will inſtance in *two*, *ſc.* *Nitre* and *Marine Salt*; if I may have leave to reckon them amongſt *Mineral Bodies*. As for *Nitre*, by mixing of *four Liquors* together, and then ſetting them to *ſhoot*; I have obtained *Cryſtals* of *true* and *perfect Salt*; which have had much of a *nitrous taſt*; and would be *melted* with a *gen-*

tle heat, as *Nitre* is; and even as eaſily as *Butter* it ſelf: I mean, not by the addition of any ſort of *Liquor*, or any other body, to *diſſolve* it; but *only* by the *fire*.

And as for a *Sea-Salt*, that I might *Imitate Nature* for the *making* hereof, I conſider'd, That the *Salt* ſo called, was nothing elſe but *Animal* and *Vegetable Salt*, freed from its true *Spirit* and *Sulphur*, and ſome *Saline particles*, *ſpecifically Animal*

mal or *Vegetable*, together with them. For both *Animal* and *Vegetable* bodies being continually carried by all *Rivers* into the Sea; and many likewiſe by *Shipwrack*, and divers *other* ways, *immerſed* therein: they are at laſt *corrupted*, that is, their *Compounding* parts are *opened* and *reſolved*. Yet the *Reſolution* being in the *Water*, is not made *precipitately*, as it is in the *Air*; but by degrees, and very *gently*.

Whence the *Sulphurious*, and *other* more *Volatile* parts, in their *avolation*, make not ſo much *haſt*, as to carry the more *fixed Saline* parts along with them; but leaveth them behind in the *Water*, which *imbibeth* them, as their proper *Menſtruum*.

And the *Imitation* of *Nature* herein, may be performed thus; Put as much of a *Lixivial Salt* as you pleaſe, into a wide mouth'd bottle, and with fair *Water* make a ſtrong *Solution* of it; ſo as ſome part thereof may remain *unreſolved* at the bottom of the bottle. Let the bottle ſtand thus for the ſpace of about half or three quarters of a year, all the time unſtopped. In which time, many of the *Sulphurious* and *other* more *Volatile* parts gradually flying away; the top of the *unreſolved Salt* will be *incruſtate*, or as it were *froſted* over, with many ſmall and hard *Concretions*, which for their nature, are become a true *Sea-Salt*. Whereof there is a double proof; *Firſt*, In that moſt of the ſaid *Concretions* are of a *Cubical*, or very like *Figure*. Eſpecially on their *upper* parts; becauſe having a *fixed body* for their *baſis*, their *under* parts, therefore, contiguous thereto, are leſs *regular*. Whereas the parts of *Salt* in the Sea, being environed on all ſides with a *fluid*; their *Figure* is therefore on all ſides *regular*. *Secondly*, In that a ſtrong *Acid Spirit* or *Oyl* being powred upon a *full body'd Solution* hereof; yet it maketh herewith no *Ebullition*; which is alſo the *property* of *Sea-Salt*. And thus much for the more *general Imitation* of *Bodies*.

Inſtance III.

FROM the aforeſaid *Premiſſes*, and by the aforeſaid *Means*, there is no doubt to be made, but that alſo the other *ſenſible Qualities* of Bodies may be *Imitated*, as their *Odours* and *Taſts*. And that not only the *general* ones, as *Fragrant*, or *Aſtringent* : but alſo thoſe which are *ſpecifical* and *proper* to ſuch a *ſpecies* of Bodies.

dies. Thus, for *example*, by *mixing* ſeveral *Bodies* together, in a due *proportion*, I have *Imitated* the Smells of *divers Vegetables*; as of *Tanſy*, of *Lignum Rhodium* , and *others*. And I conclude it feaſable, To *Imitate* the *Taſt* or Smell of *Musk*, or *Amber-greece*, or *any other* body in the world.

Inſtance IV.

HENCE alſo we may be *Taught*, How to *Imitate* the *Faculties*, as well as other *Qualities* of Bodies. The reaſon is, becauſe even *theſe* have no dependance upon any *ſubſtantial Form*; as in the firſt *Part* of my laſt *Book* of the *Anatomy of Vegetables*, I think, I have, in a few lines, clearly made out: but are the meer reſult of *Mixture*; effected by the ſame *Cauſes*, whether in *Nature* or *Art*; as alſo in the *premiſſes* of this *Diſcourſe* hath been ſhew'd.

Inſtance V.

FROM whence, *again*, it is likewiſe a *Key* to *Diſcover* the *Nature* of Bodies. For how far ſoever we can attain to *Mingle*, or to *Make* them, we may alſo know *what they are*.

For Bodies are *mingleable*, either *of themſelves*, or by ſome *third*. As to thoſe which *mingle of themſelves*, we may certainly conclude, That there is a *congruity* betwixt them, in ſome reſpect or other. So upon various tryals I find, that *Eſſential Oyls* do more eaſily *imbibe* an *Acid*, then an *Alkaly*. Whence it is evident, That there is ſome *congruity* and *ſimilitude* betwixt *Eſſential Oyls*, and an *Acid*, which there is not betwixt the ſaid *Oyls* and an *Alkaly*.

As to thoſe that mingle only by ſome *third*; we may alſo certainly conclude, That though the *two extreams* are *unlike*; yet that they have both of them a *ſimilitude* to or *congruity* with that *third*, by which they are *united*.

Moreover, We may make a *Judgment* from the *Manner* or *Degree* of *Mixture*. Thus the *Acid Spirit* of *Nitre*, as is ſaid, will *coagulate Oyl-Olive*, and render it *conſiſtent*. Whence it might be thought, That any other ſtrong *Acid* will do the like; and that therefore, there is no great difference in the *Nature* of the ſaid *Acid Liquors*. But the contrary hereunto, is proved by *Experiment*. For having *digeſted* the ſame *Oyl*, in the ſame *manner*, and for a much *longer* time, with ſtrong *Oyl* of *Sulphur*; although it thence acquired ſome change of *Colour*, yet not any *Conſiſtence*.

Again, Becauſe the ſaid Spirit of *Nitre coagulates Oyl-Olive*; it might be expected, it ſhould have the ſame effect, upon *Oyl* of *Aniſe-ſeeds*; or, at leaſt, that if other *Acids* will *coagulate Oyl* of *Aniſe-ſeeds*, that this ſhould do it *beſt*. But *Experiment* proveth the contrary. For of all I have tryed, *Oyl* of *Vitriol* is the only *Acid*

Acid that doth it *inſtantaneouſly.* *Oyl* of S*ulphur*, if very ſtrong, will do it; but not ſo *ſoon*, nor ſo *much.* *Aqua fortis*, and S*pirit* of S*alt*, for the preſent, *do not* at all *touch* it. And S*pirit* of *Nitre* it ſelf will not *coagulate* it, under *eight* or *ten* hours at leaſt.

Inſtance VI.

LASTLY, and *conſequently*, It is a *Key*, To *Diſcover* the *Medicinal Uſe* and *Operation* of Bodies. Thus, for *example*, by the *Imitation* of *Roſins* and *Reſinous Gums*, we certainly know what all of them *are*, and *when*, and *wherefore* to be *uſed*. For what are *Maſtick*, *Fran-*

kincenſe, *Olibanum*, *Benzoin*, and *other like Roſins*, or *Reſinous Gums*, for their *principal* and *predominant* parts, that is, *qua Roſins*; but Bodies reſulting from *Natural*, in like manner, as I have ſhewed, they may be made to reſult, from *Artificial Mixture*? That is to ſay, the *Oleous*, and *Acid* parts of *Vegetables*, being both *affuſed* and *mingled* together,

ther, *per minima*, in ſome one *Veſſel* of a *Plant*, they thus *incorporate* into one *conſiſtent* and *friable* body, which we call *Roſin*.

Now from hence it is, that the ſaid *Roſins*, and *Reſinous Gums*; as alſo *Amber* and *Sulphur* for the ſame reaſons; are of ſo great and effectual *Uſe* againſt moſt *thin* and *ſalt Rheums*; *ſc.* as they are *Acido-*

oleous Bodies. For by their *Acid* parts , which in all theſe Bodies are exceeding *copious* , they *mortifie* and *refract* thoſe *ſalt* ones which feed the *Rheum*. And by their *oleous* parts , the ſame *ſalt* ones are alſo *Imbibed*. Whence , they are all , in ſome degree, *incorporated* together ; that is , the *Rheum* is *thickned* : which is the deſired *effect*.

Whereas, on the contrary, if the *Cough* proceed not from a *thin* and eſpecially a *ſalt Rheum*, but from a *Viſcous Flegm*; the uſe of *many other* Bodies, which are alſo more *oleous*, and abound not ſo much with an *Acid* as *theſe* do, eſpecially *ſome* of them, is more proper: ſuch as *theſe*, in this caſe, proving ſometimes not only *ineffectual*, but *prejudicial*.

Since the very *Cauſe* of the ſaid *Viſcouſneſs* of *Phlegm*, is chiefly ſome great *Acidity* in the *Blood*, or in ſome other *part*; as may be proved by divers arguments.

Many more *Inſtances* might be hereunto ſubjoyned: and may hereafter be offered to the acceptance of ſuch, who are inquiſitive into *matters* of this *Nature*. If I ſhall not herein anticipate, or reiterate the *Thoughts* and *Obſervations*, of thoſe two *accurate* and *Learned Perſons* Dr. *Willis*, and Dr. *Walter Needham*, as to what the one hath already *publiſhed*, and both have put us in *expectation* of. But the *Inſtances* already given, are ſufficient to evidence what I have ſaid. And, I hope, this preſent *Diſcourſe* to prove, in ſome meaſure, thus much;

That *Experiment* , and the *Common* Notions of *Senſe* are *prolifick* ; and that nothing is *barren*, but phancy and *imagination.*

FINIS.

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